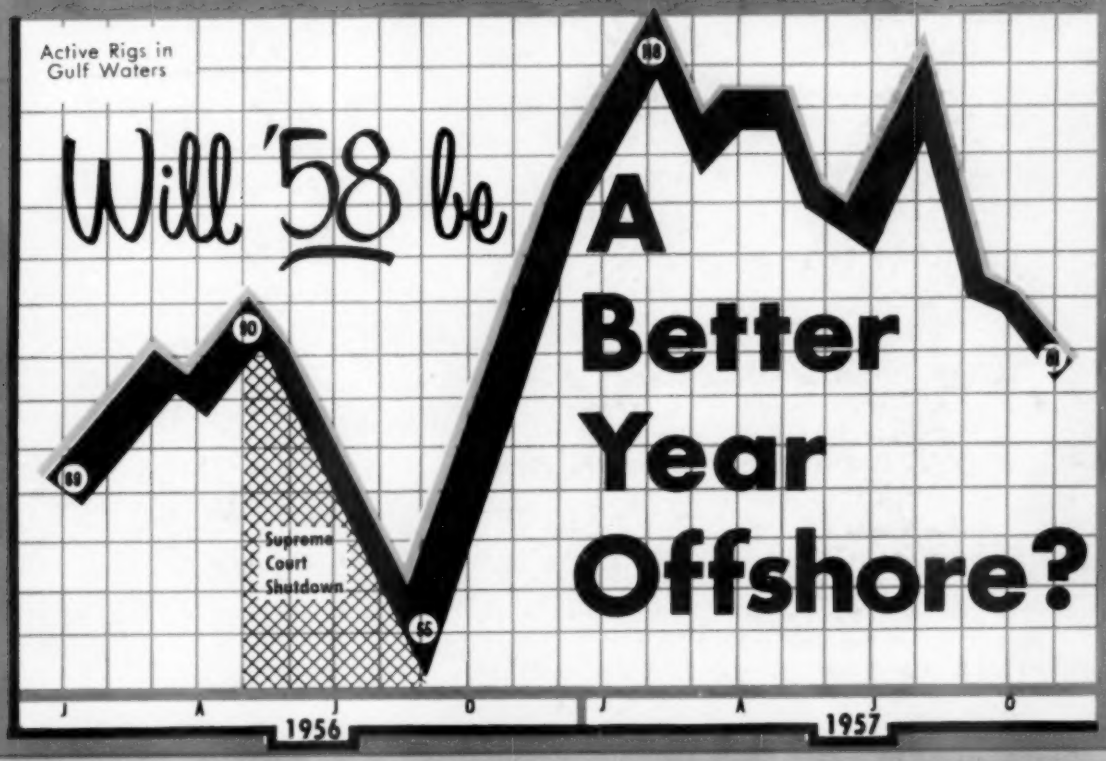
the OIL AND GAS JOURNAL

DECEMBER 16, 1957



Will '58 be A Better Year Offshore?

p. 64

Natural Gas to England by Ship

. . . is the bold plan of Continental. It's only months away, and success could mark milestone in world's fuel-supply picture. p. 59

Charts tell: **How much air** to put down the hole. p. 104

Greetings from

HALLIBURTON

OIL WELL CEMENTING COMPANY

OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 16, 1957

The offshore oil industry is having its troubles:

Here's the current picture on the Gulf Coast.

Operators are gloomy about prospects for a near-term payout on their heavy investments.

The reason: Lowered production allowables, fouled-up politics, terrific expenses. Some just plain aren't finding the oil they expected.

Balance sheet at first of the year: More than $2 billion invested in the gulf, less than $500 million return.

Drilling contractors are hit hardest by the downturn.

They faced the specter of idle rigs and cutthroat bidding, brought on by a levelling off in tidelands drilling.

Hardest hit are the latecomers and owners of the big and expensive deep-water rigs.

But the long-term outlook is still good for most.

Estimates of reserves still remain high. Most agree there's still plenty of oil to be found in the gulf.

Pipelines are coming for both oil and gas. If allowables go up, some of the pressure will be eased.

Contractors see a ray of hope in movement of excess equipment to foreign work and in prospects of new leasing (p. 64).

All the experting now being done on the general economic outlook these days boils down to this:

You can expect the rest of 1957 to be on the off-side.

Factors already are at work to reverse the cycle, but the upturn likely won't show until the second half of 1958.

Pump primers expected to turn the trick: Defense spending on the upgrade. Money easier and less costly to obtain. Wages still rising and farm income being revived.

There's good news for oil marketers in the brighter picture for farm machinery.

After 4 poor years, sales in 1957 have turned up and outlook for 1958 is even better.

In the future, tractor replacement needs alone are put at 300,000 units by 1960 and 445,000 by 1970. Then each farm

will average 2.2 tractors compared with little more than one now.

This increased mechanization means a growing market for fuel sales.

A long-awaited experiment in moving liquefied methane by tanker will come off sometime in the New Year.

The big test now is being set up. Here's the rundown:

A ship is being secretly converted at Mobile.

Supplies of gas in the Western Hemisphere and a market in England are being lined up.

Storage and pipeline in England are being built to handle the liquid gas at 250 below zero and then process it.

If the voyage is a success, it opens tremendous possibilities for a new industry supplying cheap fuel to energy-hungry sections of the world (p. 59).

Another project to keep your eye on: The first civilian atomic power plant.

The plant went into operation early this month at Shippingport, Pa., where Duquesne Light Co. is expected to turn out 60,000 kw. daily of electricity.

Importance to oil industry: Plant should give first hints on when and if nuclear energy will be competitive with fuel oil.

The drag bit is staging a minor comeback.

A few wise contractors in South Texas are using drag bits to cut shallow, soft formations and then switch to rock bits.

They report drag bits cut rotating time by as much as 33 per cent when properly used (p. 125).

Insurance may be a new problem for offshore drillers.

There's talk that London underwriters, principally the insurors of drilling equipment on the gulf, may withdraw from the field. Their losses between March 1 and September 1 reportedly total more than $8 million.

It's unlikely that big insurance companies will quit. Higher rates seem more probable.

Rush to pick up leases in Alaska has prompted Government to increase staff of land offices at Anchorage and Fairbanks.

Following Richfield strike, applications for more than 16 million acres have been received. Before that only 8 million acres had been leased through the land office.

A Juneau bulletin gives these reports on three key wells:

After temporary halt for winterizing, Humble has resumed drilling and is below 4,000 ft. on Bear Creek Unit No. 1.

Colorado Oil & Gas is below 9,750 ft. in its second hole near Yukatat.

Richfield already is below 4,300 ft. in its second well.

Discovery well is presently capped awaiting further exploration on Kenai Peninsula.

The Rocky Mountain area remains a hot oil province.
It's one of the few exploratory areas in the country to show a higher discovery rate this year than last.
The scoreboard up to December 1: Some 161 oil strikes and 44 new gas fields out of a total of 1,762 wildcats. This is a success ratio of 11.6 to 1.
The stepped-up wildcatting tempo is offsetting a decline in completions for the region. The hot wildcatting areas are Colorado, Nebraska, Northwest New Mexico, Wyoming

Labor has lost first two Permian basin elections.
Employes of two Odessa oil-well service firms, Williamson and P. L. & B., voted down union representation last week by large margins.
Similar elections among employes of five basin drilling contractors are coming up next week.
Union, leaders, now on defensive, say the drilling crews will be easier to organize. Contractors, however, believe the first two votes show how most drilling workers feel.

Is shift in government policy on tidelands occurring?
Attorney General Rogers now says Justice lawyers will give Supreme Court full historic and legislative background on each state's case. This will include Eisenhower's recent letter and other material favorable to claims of Texas for 3-league limit.
Under Brownell, department lawyers consistently argued no state could have boundary beyond 3-mile limit.
Texas officials think administration is talking out of both sides of its mouth.

Exploration notes: Navajos pocketed a record $8,123,867 in bonuses for 7,394 acres of tribal lands in San Juan County, Utah. Bids averaged $1,099 per acre with Carter paying all-time record $4,308 per acre. Texaco picked up the most acreage...The Interior Department's plan to ban oil and gas leasing on wildlife refuges is stalled pending a congressional investigation by O'Mahoney committee...San Jacinto and partners have a big well on expensive Lake Maracaibo acreage. It's reported flowing at 5,760 bbl. daily.

Oil men will be interested in what three oil executives see down the road for the industry:
Humble's Morgan Davis: Texas allowables may rise no higher than a 15-day producing month for about 2 years. Oil and gas will continue as favored fuels for rest of century with high rates of drilling needed to meet the demand. But unless exploration costs are brought under control, oil runs danger of pricing itself out of the energy market.

Conoco's L. F. McCollum: Domestic demand should increase by 3 per cent in 1958. Price levels for refined products are low and show no signs of firming soon. But industry put its house in order in 1957, and this will help it in coming year.

Socal's R. G. Follis: Domestic demand should increase nearly 3 per cent, free-world foreign 10 per cent in 1958. Factors supporting forecast: Long-term population growth trend in this country and expectation that winter temperatures will return to their normal cold pattern.

Use of API gravity as pricing base for crude has come under attack again.

Two researchers claim a more realistic method of assigning practical values to crude now is needed. They propose an evaluation based on certain hydrocarbon fractions contained in the oil regardless of its origin or gravity.

Their special study of two crudes of similar gravity shows a refiner may realize as much as 20 cents per barrel more profit out of one than the other.

Pipeliners note: A new double-jointing technique for inside and outside welding promises tremendous savings on big-inch projects.

Process increases output of double joints by 50 per cent and reduces time taken to complete project. It also cuts stringing costs. An added advantage on foreign jobs: Fewer manual welders are needed (p. 82).

Another gas firm has moved into exploration work.

Preston Oil Co., affiliate of Columbia Gas System, is now hunting gas in South Louisiana.

It again points up increasing difficulty pipelines face in obtaining large quantities of gas to meet projected demands 5 years from now.

Expected next year: An investigation of rates charged by independent producers for gas sold in all areas to interstate pipelines.

FPC will make it the first order of 1958 business.

Government is moving to keep its engineers and scientists in federal service with a pay increase.

Salaries of 48,000 federal technical employes were increased as much as $1,080 a year effective this month.

The raises followed a special study. It pinpointed that low pay scales and fewer benefits were reasons why scientists preferred private industry to government work.

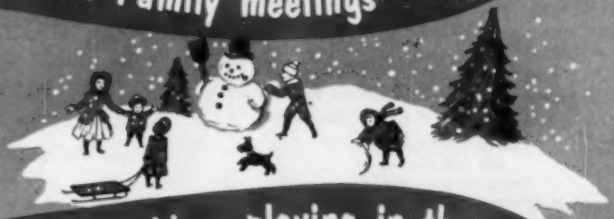
Private industry also is moving to increase the ranks of scientists.

Esso Education Foundation last week made a $1.5 million grant to aid education for engineering and science over next 3 years. This is in addition to a previous $1.3 million grant.

Of all the joys that Christmas brings
The best are made of little things . . .

Hearing Church bells . . . tinkling sleigh bells

Friendly greetings . . . Family meetings



Watching home fires softly glow—Children playing in the snow

And sending wishes warm and true
for Christmas cheer to folks like you!

THE Bovaird SUPPLY COMPANY
GENERAL OFFICES
TULSA, OKLAHOMA

86 YEARS OF PROGRESS WITH THE OIL INDUSTRY

The OIL AND GAS JOURNAL

DECEMBER 16, 1957 • VOLUME 55 • NUMBER 50

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

THE STAFF

Kenneth B. Barnes ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
C. O. Willson ..... Consulting Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
Neil Williams ..... Associate Editor
Norman S. Morrissey Drilling-Development Editor
Carl J. Lawrence ..... Assistant News Editor
Gene T. Kinney ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
C. Dudley Johnston ..... Art Director
Carl Hoot ..... District Editor
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
Robert B. Bizal ..... District Editor
Howard M. Wilson ..... District Editor
Sara Bangert ..... District Editor
LaWanda Turner ..... Readership Research
Max L. Batchelder ..... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
Susan Boeckman ..... Editorial Assistant
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber ..... Refining Editor
Paul Swain ..... International Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726

Larry Reser ..... District Editor
Ed McGhee ..... District Editor
Joe Reilly ..... District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone Riverside 8-3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont ..... District Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

The Oil and Gas Journal, published Mondays, copyright 1957, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

IN THE NEWS

General Interest:

Revolutionary Plan Will Ship Natural Gas to England 59
Esso Announces $1.5-Million Education Plan 63
Offshore Operators Gloomy Over Slow Production Payout 64
OCAW Makes Money on Stock in Union-Organized Firms 67
U. S. Attitude May Change As Ike Backs Texas in Tidelands 68
West Coast Will Be Added to Import Control Program 69
Sohio, Ashland Cut Tri-State Crude Price 73
Government Plan to Bar Wildlife Land Leasing Is Stalled 74
Aramco, Saudi Arabia to Arbitrate $100-Million Dispute 78
Indonesia Unrest Worries Big Investors 80
Saudi Arabia Signs Persian Gulf Deal With Japanese 81

Exploration:

Alberta's Innisfail Field Has 12 Producers in 6 Months 62
Companies Bid $8 Million-plus for Four Corners Tracts 63
San Jacinto Is Fourth Newcomer to Hit in Maracaibo 78
Wyoming Score: 257 Oil Fields 163
Nebraska's 1957 Record 164
Pecos Valley Area Gets Devonian Production 180

Processing:

Two Fires Cause Heavy Damage at New Orleans Tank Farm 67
Gravity Method for Pricing Crude Meets Opposition 76
Processing Briefs 77
Colombian Refinery Goes on Stream at Cartagena Bay 79
Burmah Oil and India Agree on Refinery for Assam 81

Production and Drilling:

Union Beaten Twice in Permian Basin Driller Elections 62
Long Beach Officials Submit Subsidence Plan 72
Austria May Ask Private Companies to Develop Reserves 81

Pipelining:

First Interstate Ethylene Pipeline to Start Soon 68
Kansas to Get 242-Mile Pipeline for Wichita Refinery 69
FPC Has Gas Rate Study at Top of Agenda Next Year 69
Tough New Pipeline Coating Promises to Cut Costs 70
Court Clears Way for Texas-to-Florida Gas Line 73
Pipeline Briefs 75
FPC to Hear Little Inch Conversion Case December 23 77
Trans-Iranian Pipeline Will Be Completed Next Year 79

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY–OPERATION

Refining-Processing

How To Control Static Electricity in Commercial Tankage 89

W. M. Bustin, T. L. Culbertson, and C. E. Schleckser, Jr.

Current safety measures include low pumping rates, avoidance of surface agitation and water, and use of floating-roof tanks to eliminate the vapor space. Tanker compartments are gas freed when necessary. Carbon dioxide-gas blanketing is planned for some barge operations.

Butadiene—4: Feed Preparation and Finishing 110

John C. Reidel

Close volatilities of the C_4's make their separation difficult. One process scheme employs acetone or acetonitrile extractive distillation for the feed preparation and extraction with cuprous ammonium acetate for butadiene recovery.

The Refiner's Notebook 129

Questions On Technology 131

The Foreman's Page 133

Drilling-Production

New Line on Fluid Flow in Porous Media . . 85

O. K. Kimbler and B. H. Caudle

A photographic technique has been developed to observe fluid displacement over large areas of porous media, while at the same time detailing the individual pore spaces. Numerous displacement studies have been made with the technique. Several new concepts have been worked out.

Air Requirements in Air Drilling 104

J. O. Scott

During air drilling enough air must be circulated to blow the cuttings out of the hole readily. When the volume is adequate, the hole will stay clean and cuttings will not accumulate when the circulation is suspended. Here are three correlations which will reduce the work required in calculating necessary air for drilling.

Did We Bury the Drag Bit Too Soon 125

Ed McGhee

Since Spindletop, rotary drillers have adopted a lot of new tools and thrown away a lot of old ones to keep stepping up drilling rates. One tool thrown away was the drag bit. That may have been a mistake.

Pipelining

Automation Scores in Double Jointing 82

Paul Reed

An entirely new type of unit has been built to take advantage of the utmost in automation which can be applied in handling, rotating, and welding of pipe during double-jointing operations. Its production rate on 30-in.-diameter pipe is 10 to 12 welds per hour.

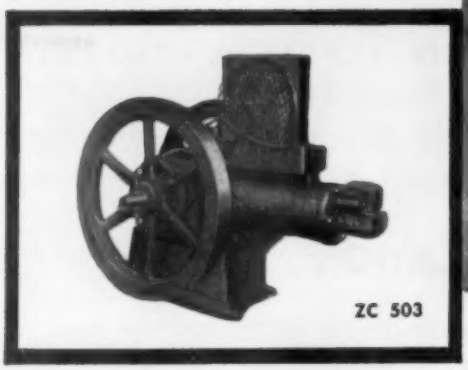
On The Job . . . Pipelining: New Ideas for Gathering System Construction 134

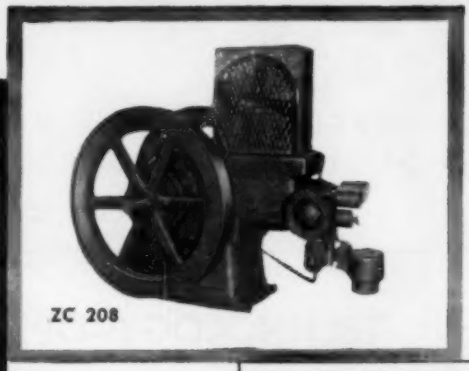
Paul Reed

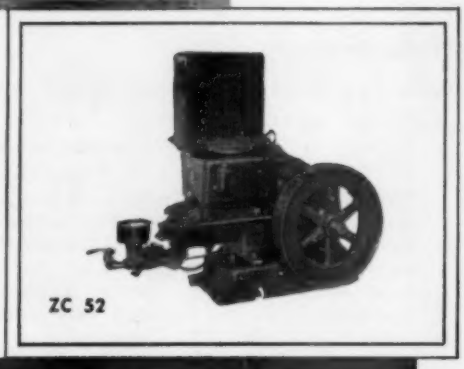
Here are new ideas for handling asphalt mill-coated pipe, welding operations, ditching, building of erosion dams, overhead crossings, and a submerged crossing.

DEPARTMENTS

They Say	46	Foreman's Page	133	Deaths in the Industry	192
Calendar of Events	50	On the Job . . . Pipelining	134	Statistical Summary	194
Journally Speaking	55	Drilling Contractors	141	Drilling Statistics	195
Editorial	57	New Equipment	145	Supply Statistics	196
Watching Washington	61	Trade Literature	151	Refining Statistics	197
International News	78	Equipment Men in News	157	Markets	198
Refiner's Note book	129	Exploration Highlights	163	Classified Advertising	200
Questions on Technology	131	Personals	190	Advertisers' Index	203


ZC 503


ZC 208

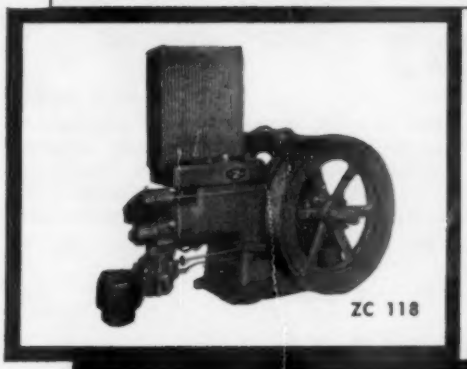

ZC 52

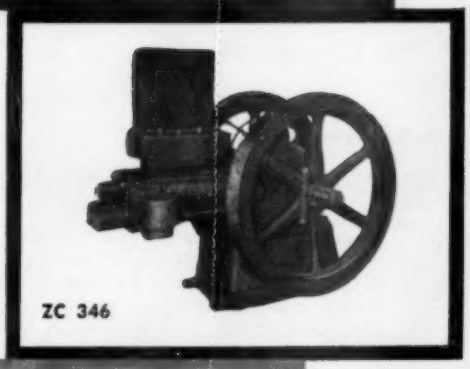
pick a "ZC" that best fits your pumping unit!

The broad Fairbanks-Morse "ZC" line has an engine that will best fit your pumping unit . . . from 3 to 30 hp. They're economical and easy to maintain—simply designed with no complicated parts or delicate adjustments.

All "ZC" sizes are high displacement, heavy-duty, slow-speed models—ideal for oil field pumping service! And, all sizes have the famous extra-heavy double flywheel for symmetry and perfect balance . . . with power take-off on either side of the engine.

See your local supply store about the "ZC" line . . . or write Fairbanks, Morse & Co., Chicago 5, Illinois.


ZC 118

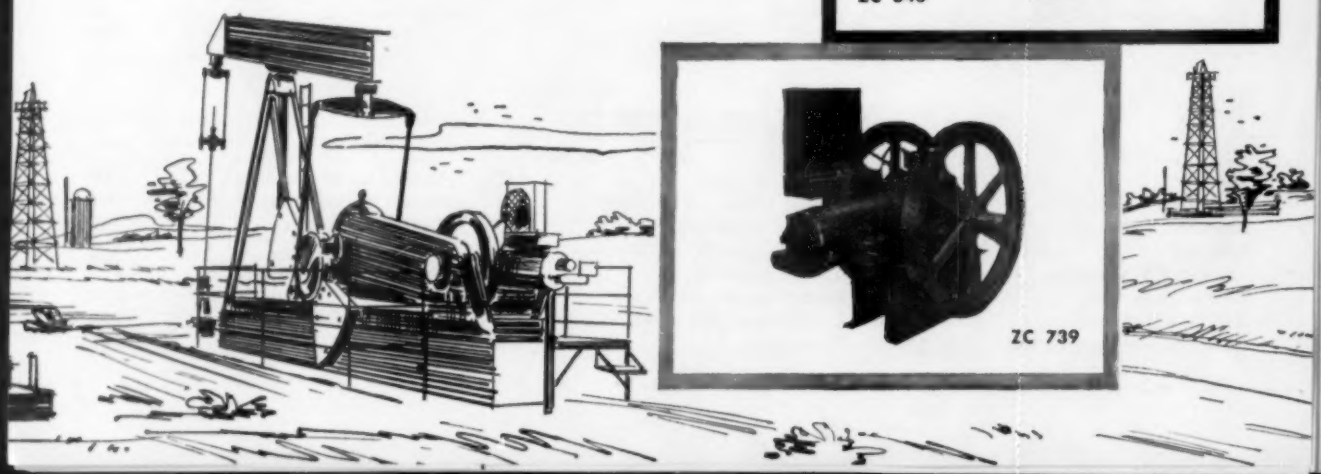

ZC 346

FAIRBANKS-MORSE

a name worth remembering when you want the best

OIL FIELD EQUIPMENT • PUMPS • SCALES • GENERATORS
ELECTRIC MOTORS • LIGHT PLANTS • DIESEL, DUAL FUEL &
GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES

ZC 739



B.F.Goodrich V belt briefs—

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

There's danger in replacing just one V belt at a time

When one or two belts in a set become worn or damaged, there's a big temptation to replace just the useless belts. Trouble is that the remaining belts have been stretched through use beyond their original length. The new, shorter belts have to carry most of the load. A severe shock or load strain will easily break these new belts. That's why it's always better to install a matched set of V belts rather than replace one belt at a time. Used belts can be put on a drive requiring a smaller number of belts.

This simple test can increase belt life 50% or more

Maintaining correct tension is one of the most important rules of V belt care. It will give belts at least 50% longer life—often doubles life.

Belts that are too loose will slip, causing both belt and sheave to wear out. If they sag too much, the snapping action caused when motor starts or when peak loads occur can actually break belts in two. ***To test tension,*** press down firmly on each belt. Belts that are properly tensioned will depress an amount equal to their own thickness for each 4 feet of center-to-center distance. For example, if the center-to-center distance is 8 feet, a D-section belt which is ¾ inch thick should depress twice its thickness—1½ inches.

What gives V belts their gripping power?

When a V belt fits properly into the sheave groove, it hugs the pulley side wall, produces its own grip. This high pressure contact is what gives the V belt its pulling power.

Here's why V belts made with straight sides give *extra* gripping power, transmit power better and more efficiently than other types of belts:

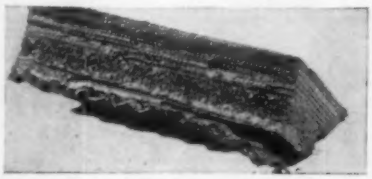
A V belt bends as it wraps around the sheave. The belt sides try to bulge, but the pulley side wall won't let them. As a result, the belt wedges itself tightly into the pulley groove.

To get an idea of how this wedging action happens, try bending a V belt outside of the pulley (as shown in the pictures at right). The bulge you see represents the *force* of this gripping action because the rubber is actually compressed by the pulley walls. This force creates all the pulling power needed for efficient service, yet without any sacrifice of belt life.

Place ruler down side of belt as shown. Ruler lies flat.

Bend the V belt, as it would be around a sheave. Now place ruler down side of belt. It no longer lies flat.

What caused this V belt failure?



Appearance: Slip burn on belt.

Cause: Belt too loose; friction of belt against pulley groove burned rubber.

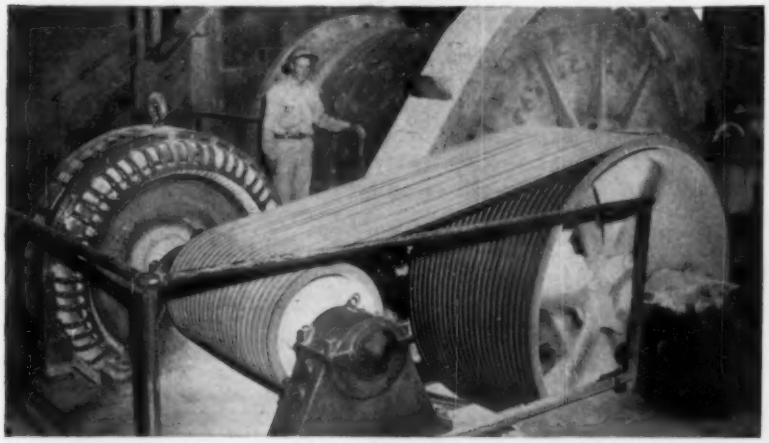
Prevention: Check tension as described in the first column. Inspect drive for overload and redesign if necessary.

Grommet eliminates cause of 4 out of 5 V belt failures

Unlike other V belts, all the load carrying cords in B.F. Goodrich Grommet V belts are concentrated in twin grommets. These grommets are cord loops made like giant twisted cables except that they're endless. There are no splices or overlaps in this cord—no weak spots to cause premature failure. Since the section where the cords overlap in ordinary V belts is where 80% of the failures occur, this cause for failure is eliminated in B. F. Goodrich Grommet belts. As a result, Grommet belts last 20 to 50% longer, depending on the service (the more severe the service, the greater the increase over ordinary belts).

Ask a factory-trained specialist

For help in selecting V belts for any kind of service, call the man who is a specialist in V belts—your B.F.Goodrich distributor. He can help you cut costs by getting longer life from your V belt drives. *B.F.Goodrich Industrial Products Company, Dept. M-236, Akron 18, Ohio.*



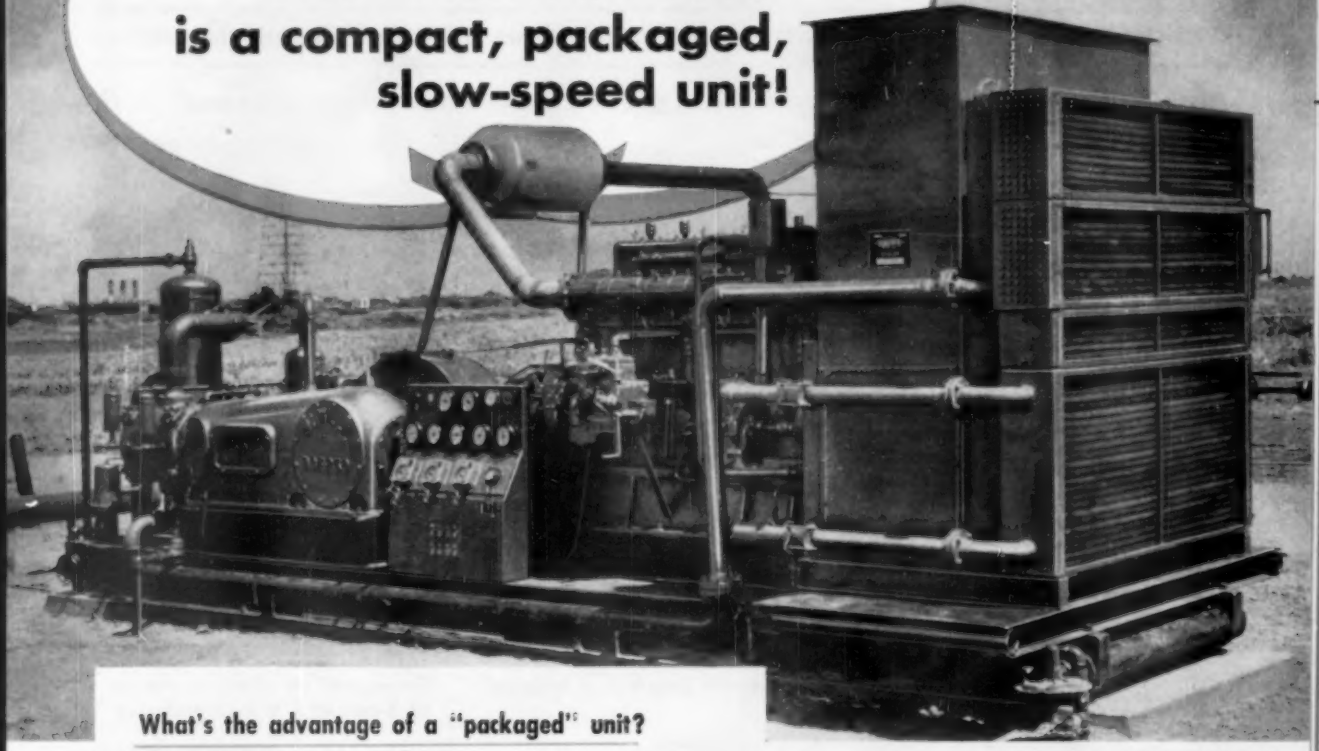
The strain of starting a heavy ball mill and keeping it turning was wearing out ordinary V belts before their time. Then Grommet V belts were tried. Because the B.F.Goodrich V belt is strong enough to pull heavy loads and take sudden jerks, the set shown lasted 6 years —longer than any other V belts used.

B.F.Goodrich

INDUSTRIAL PRODUCTS

THE "OILWELL" DGE-250 GAS COMPRESSOR

is a compact, packaged, slow-speed unit!



What's the advantage of a "packaged" unit?

Why is "slow speed" good?

Of what practical benefit is a "compact" compressor?

A PACKAGED UNIT of equal power and quality costs less, installed, than separately purchased and installed components. It is completely equipped and mounted on a heavy structural steel base, and can be trucked to location and put into operation quickly.

SLOW SPEED produces less wear on moving parts without sacrificing efficiency, reducing the cost of replacement parts and the frequency of routine maintenance repairs.

A COMPACT COMPRESSOR not only lowers installation expense; it can be serviced quickly and easily, cutting down the time and cost of shut-downs.

The "Oilwell" Model DGE-250, shown above, is a two-stage gas compressor being used in a gas-lift operation in South Texas. It is rated at 75 psig intake and 1,200 psig discharge pressures. Its capacity is estimated at 1,565,000 cu. ft. of gas per 24 hours at a compressor speed of 275 rpm. This unit is provided with inlet and interstage mist-extractor vessels, traps, and safety-float switches.

Cooling is by means of a compact, up-draft tube-and-fin radiator. It is constructed with four separate sections for: (1) engine jacket; (2) compressor cylinders; (3) interstage gas; and (4) gas after cooling.

Pressure and temperature gauges with safety controls and indicators for the compressor are grouped and mounted on a shock-resistant panel along with the engine tachometer and manifold-vacuum gauge.

OIL WELL SUPPLY

DIVISION UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices—
CALGARY, ALBERTA
CASPER, WYOMING.....COLUMBUS, O.
DALLAS, TEXAS.....HOUSTON, TEXAS
TULSA, OKLA.....LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS TRADE MARK

"OILWELL" TRADE MARK

UNITED STATES STEEL

self-aligning . . . CAN'T BIND

HOW SELF-ALIGNMENT WORKS. Spherical inner ring, free to align in any direction, assures full load capacity regardless of shaft deflection or support misalignment.

Husky bearings in husky housings adjust immediately in any direction

When high-impact loads deal out punishment, shaft deflection may spell a quick finish for ordinary bearings. But this rugged Link-Belt bearing is *self*-aligning . . . won't "pinch" or bind when misaligned.

Complete protection is provided by effective seals which block entrance of dirt, escape of lubricant. Durable housing—machined as two perfectly matched parts provides easy installation without shims or alignment rings.

Get full data on Link-Belt's complete bearing line from Book 2550. Ask any of 40 Link-Belt offices or one of our authorized stock-carrying distributors.

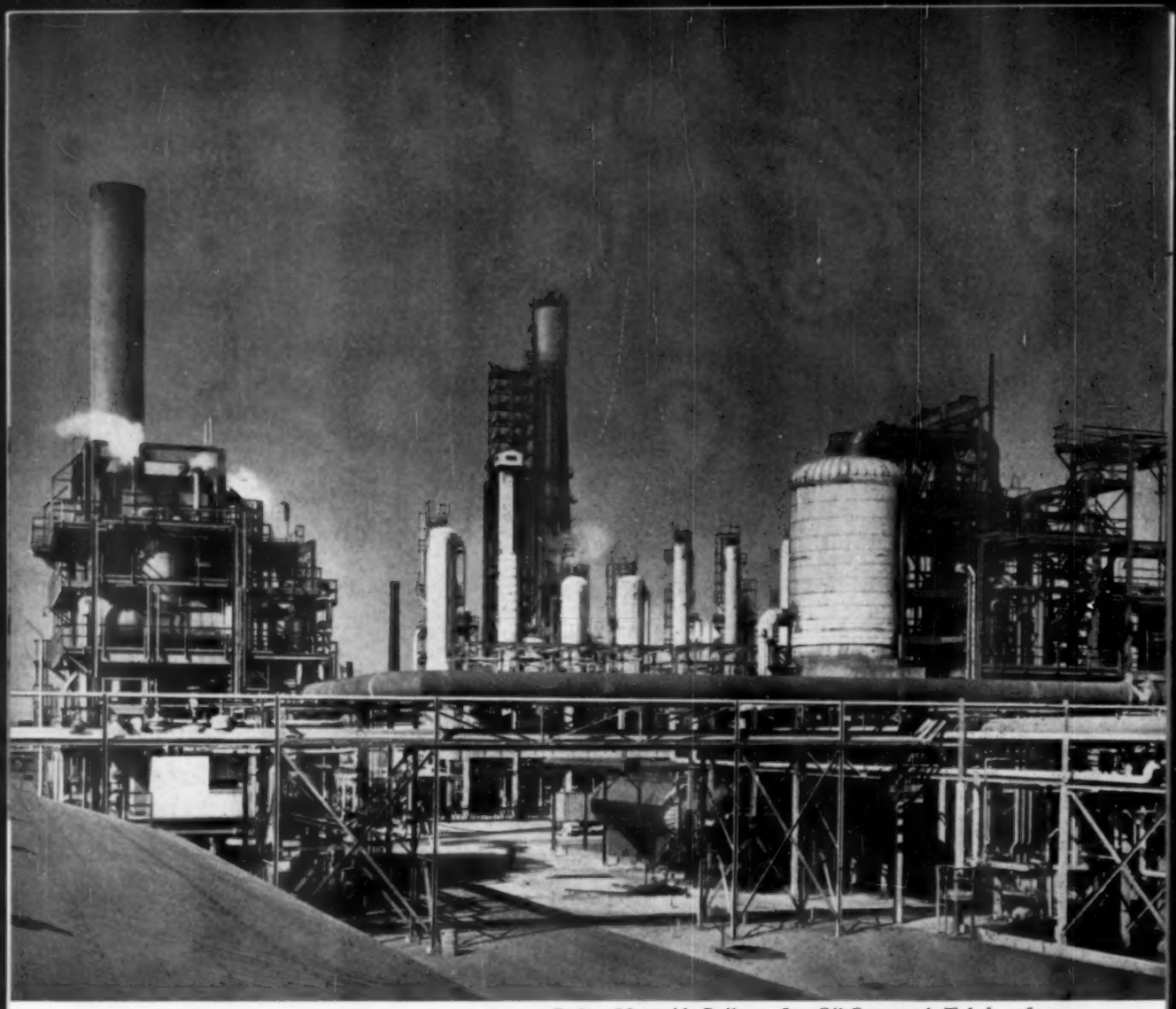
Series 6800, 6900, 7800, 7900 roller bearings have internationally standardized boundary dimensions.

LINK-BELT

self-aligning ball and roller bearings

14,441-B

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Texas, Shreveport, La., Los Angeles 22, (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.



Carbon Monoxide Boiler at Sun Oil Company's Toledo refinery.

3 B&W Carbon Monoxide Boilers Save Fuel For Sun Oil

Sun Oil Company has three B&W Carbon Monoxide Boilers in its refineries at Toledo, Ohio, and Marcus Hook, Pa. All are used with Houdriflow cracking units. The first boiler went on stream at Toledo three years ago. The second, at Toledo, and its twin at Marcus Hook, are of the oxycatalyst type.

The three B&W "CO" Boilers are effecting substantial fuel economies at both refineries.

Cracking units at Sun Oil, like others using B&W "CO" Boilers, are completely independent of outside steam and energy sources at all times. Whether or not the cracking unit is operating, steam is always available.

Extended, sustained service has proved the reliability, efficiency, and economy of B&W "CO" Boilers in refineries throughout the nation. They are flexible in design and arrangement to meet varying refinery conditions. B&W engineers can show you how a "CO" Boiler can serve your refinery, regardless of size, steam pressure and temperature requirements. The Babcock & Wilcox Company, Boiler Division, Dept. OGJ-2, 161 East 42nd Street, New York 17, N. Y.

G-824 CO

BABCOCK & WILCOX

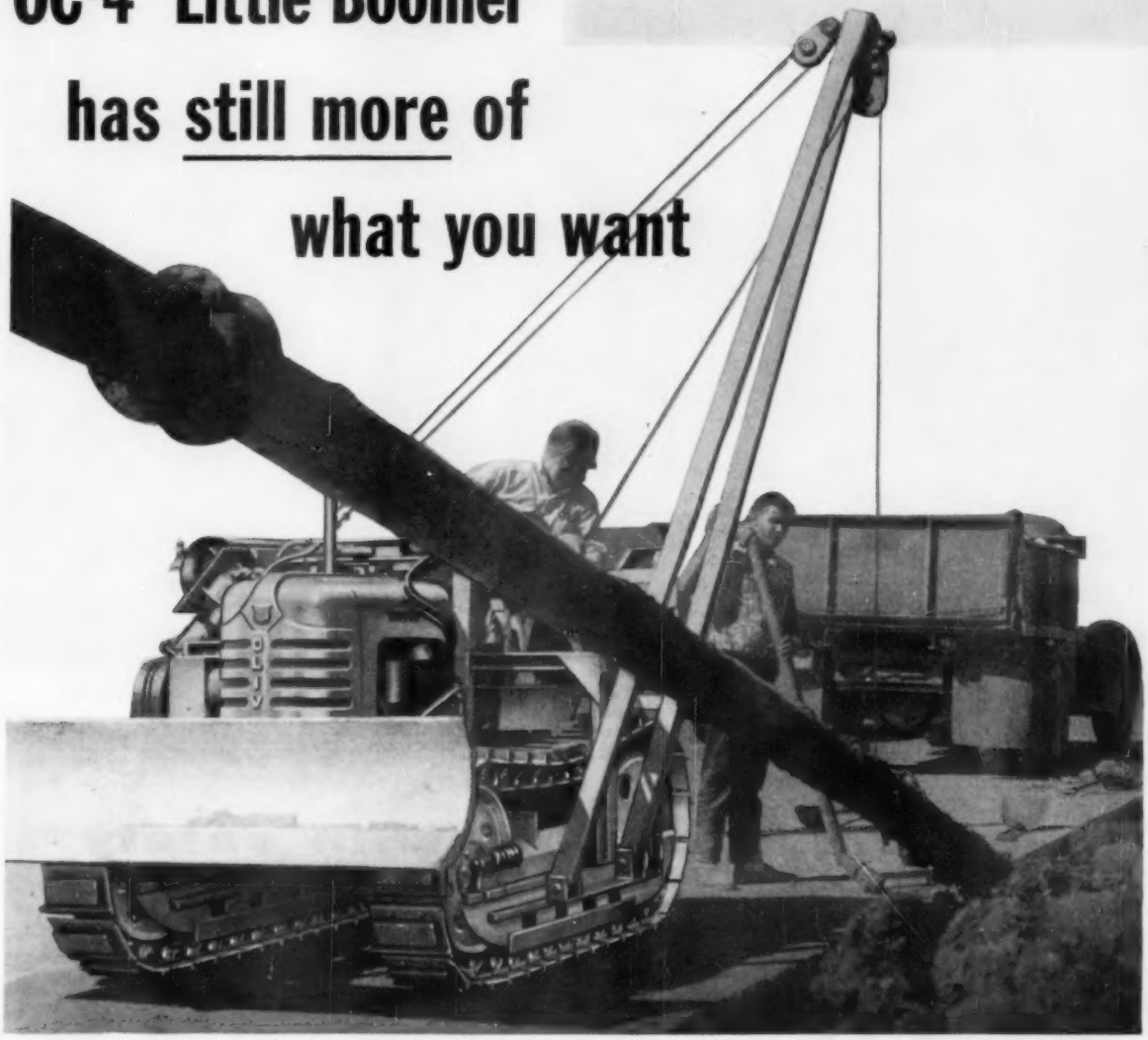
BOILER DIVISION

ALL THESE NEW IMPROVEMENTS

* Amazing capacity—lifts and carries up to 4000 lb.
* Wide 46" gauge crawler gives added stability.
* Longer crawlers give you greater traction.
* New hydraulic pump for more accurate handling.
* Raises or lowers boom while tractor is in or out of gear.
* Special dozer is hydraulically controlled.
* New 4-speed transmission answers every travel need.
* Maneuvers in tight spots more easily.

See Your Oliver Distributor

NEW OLIVER OC-4 "Little Boomer" has still more of what you want



OLIVER THE **OLIVER** CORPORATION

Industrial Division, 19300 Euclid Avenue, Cleveland 17, Ohio

a complete line of industrial wheel and crawler tractors and matched allied equipment

In carrier landings, planes coming in at more than 100 knots are stopped in a split second. This amazing performance is made possible by having each plane hook onto one of several wire ropes stretched across the flight deck. Both plane and rope receive an almost unbelievable shock at the moment of contact. Needless to say, only top-quality wire ropes can be used for this application because . . .

you can't bargain with safety

While your use of wire rope differs from this carrier application, *safety should be just as important to you.* For, although a "bargain" rope may save you money, it can cost you your peace of mind. So don't bargain with safety. Buy a rope that's a *quality* rope—buy Wickwire Rope. 5049

WICKWIRE ROPE — A CF&I PRODUCT

CF&I

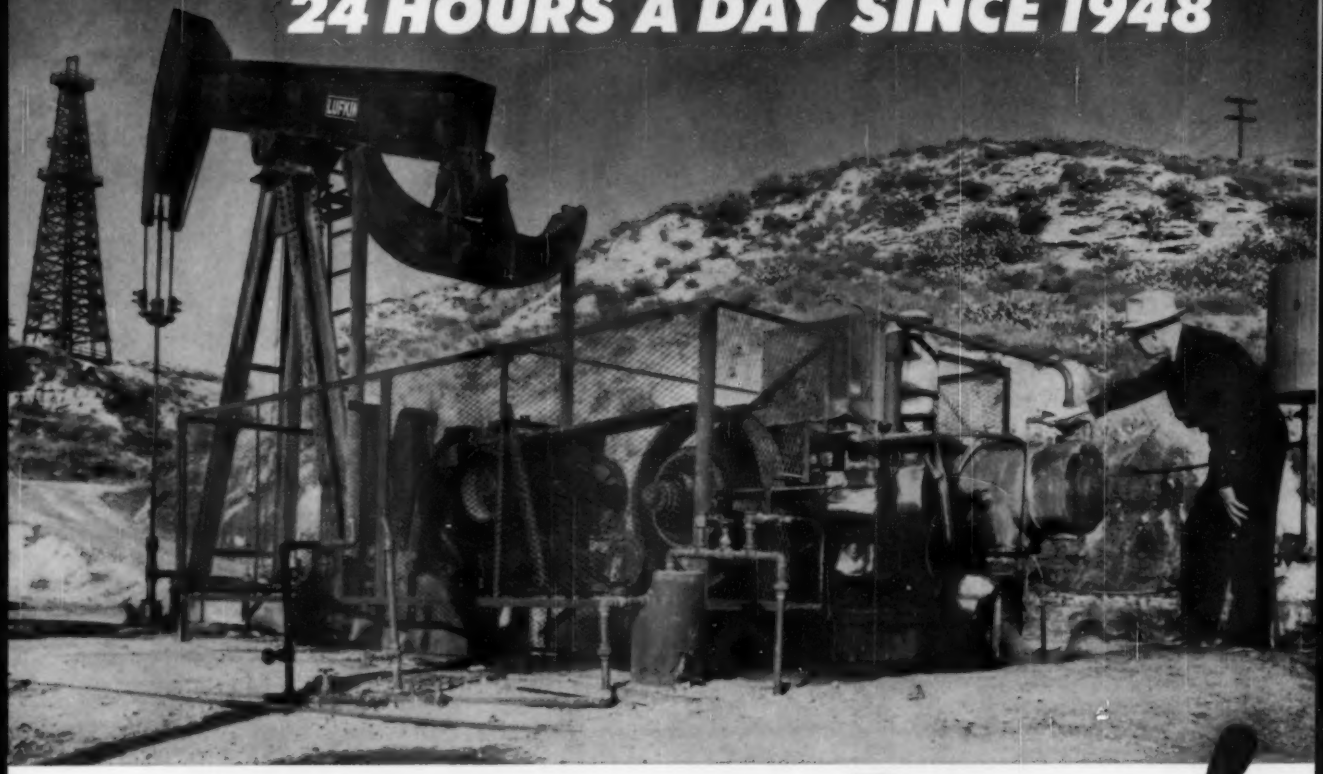
LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans
New York • Philadelphia

for instance

This *Ajax* CM-11 x 14 has been running 24 HOURS A DAY SINCE 1948



UNUSUAL? NO—JUST *Ajax!*

This is a typical AJAX workhorse on the job . . . steady, faithful, productive, making a lifelong habit of continuous daily service. Since beginning operation in 1948, the cylinder head has never been removed from the engine. • The facts are, AJAX Gas Engines work for less for longer, and they ought to be working for you. Your Supply Man will be glad to help plan an Ajax program for your particular needs. Call him.

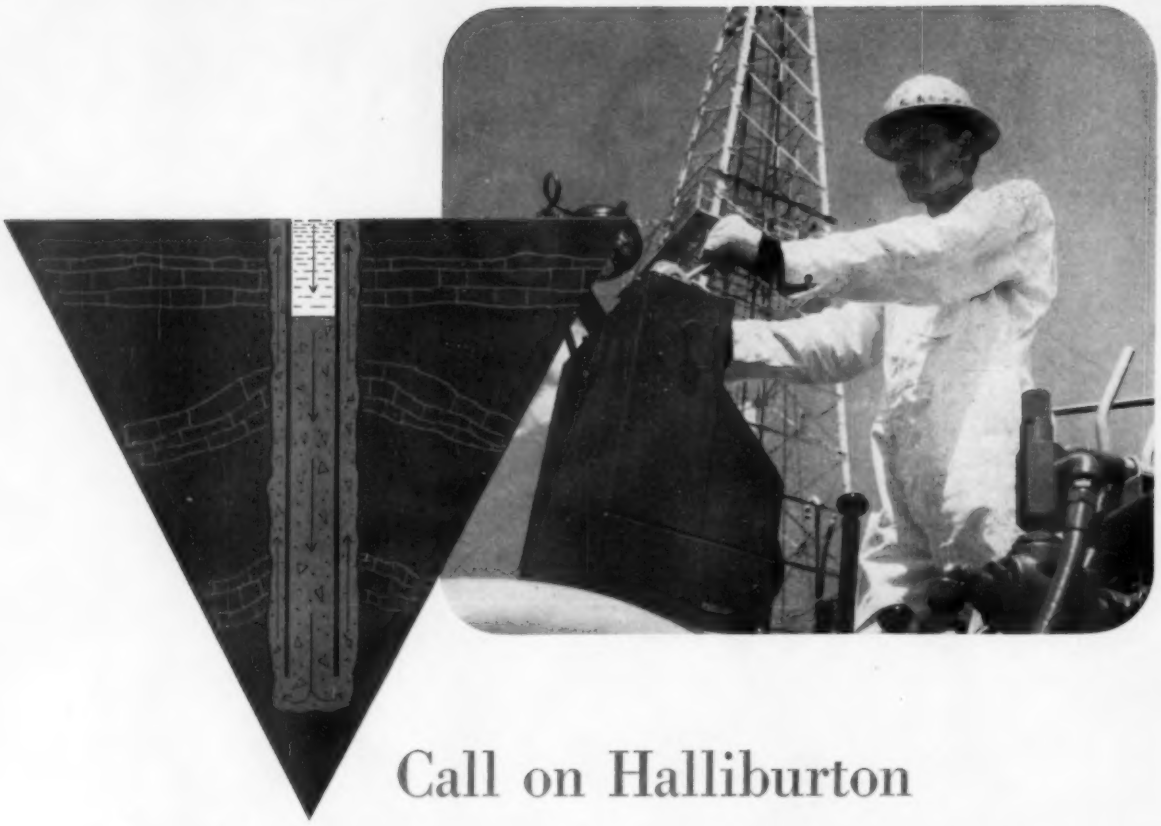
AJAX

GAS ENGINES

AJAX IRON WORKS CORRY, PENNSYLVANIA

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA. • R. B. MOORE SUPPLY CO., BOLIVAR, N. Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA



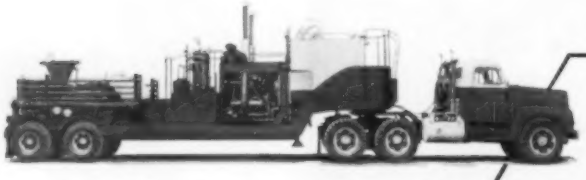
Call on Halliburton for all your cementing requirements

Oil well cementing is the combined process of mixing a cement-water slurry and pumping it through casing or tubing to critical points: around the bottom of the casing shoe into the annulus behind the casing... into the open hole below... or into a permeable formation. Oil well cementing affords maximum protection against the hazards of corrosion, blowout and contamination.

There are two cementing procedures generally used throughout the life of a well. Primary cementing deals with lost circulation problems while drilling and with the cementing of casing after possible producing formations have been located.

Secondary, or remedial, cementing deals with well completion and cementing required after the primary cementing jobs are accomplished. Specially tailored cement slurries for specific well conditions are frequently needed.

Regardless of your cementing problems—primary or remedial—you can call on Halliburton with the assurance that you will be getting the best in men and machinery, tools and techniques. For your every cementing need—ordinary or extraordinary—specify Halliburton... the world's most experienced oil well cementing organization.



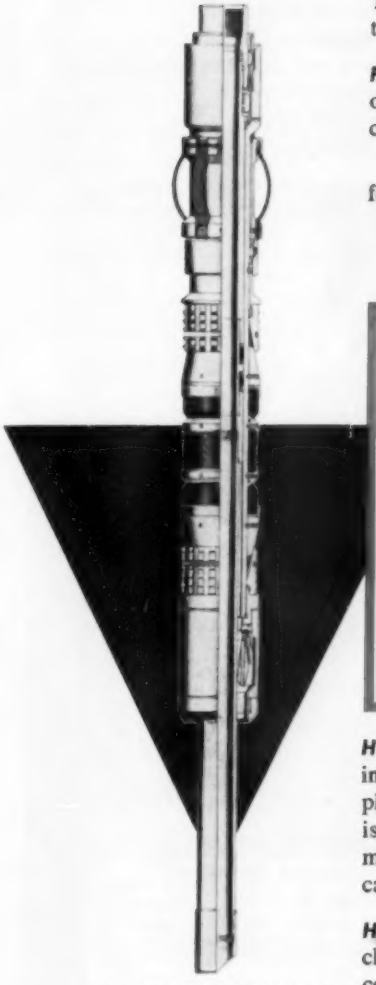
HALLIBURTON

OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA

Halliburton Aids to Modern Petroleum Technology

TYPE "C" PRODUCTION PACKER—A permanent-type drillable packer—Large bore diameter accommodates tubing-type perforating gun, flush joint and coupled tubing. Unique Latch-On Sealing Unit reduces weight required to be set down on the packer and in many cases permits tubing to be placed in tension. Also provides tight fluid or gas seal between packer and tubing string.

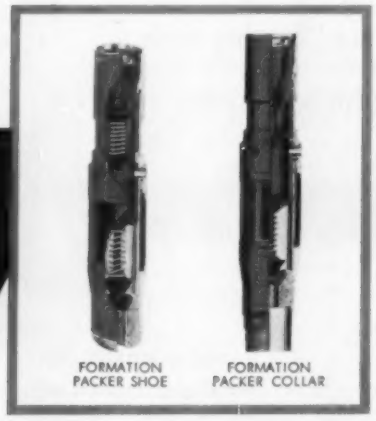
When the Type "C" Production Packer is set, the well can be treated as desired and placed on production. Effectively used in single- or dual-zone completions. Type "CL" Production Packer, similar in construction to Type "C", is designed to be run on and set by electrical wire line.



TYPE "C" PRODUCTION PACKER

FORMATION PACKER SHOE, installed on the first joint of a string of casing, offers many advantages. This shoe is used in all areas where conditions require casing to be set on top of the producing formation, because:

1. Packer Shoe packs off open hole below casing, protecting low-pressure formations from cement contamination during cementing.
2. Packer Shoe floats in and guides casing to bottom.
3. Packer Shoe has a Super-Seal Back-Pressure Valve to keep cement slurry from backing up inside the casing above the Formation Packer Shoe.
4. Packer Shoe provides circulation of fluids through end of Shoe until shoe rubber packer is expanded and set.



FORMATION PACKER SHOE — FORMATION PACKER COLLAR

FORMATION PACKER COLLAR, like the Formation Packer Shoe, is used to help protect a lower formation from contamination while cementing. Several joints of casing or liner may be installed on lower end of packer collar; this method permits "Full Hole" cementing where desirable. The packer is set and cement pumped down casing and out into annulus above expanded packer.

HR-4 CEMENT RETARDER is a chemical retarder used in portland or Pozmix Cement to retard the set to allow placement at high temperatures. A small amount of HR-4 is added to the dry cement at the bulk plant or in the mixing water to provide a tailored composition for cement casing in the deepest of wells.

HR-7 CEMENT DISPERSANT AND RETARDER is a chemical dispersant and retarder for use with high gel cement compositions. This additive is effective in obtaining smoother and more fluid gel cement slurries. Most applicable in wells where moderate temperatures prevail.

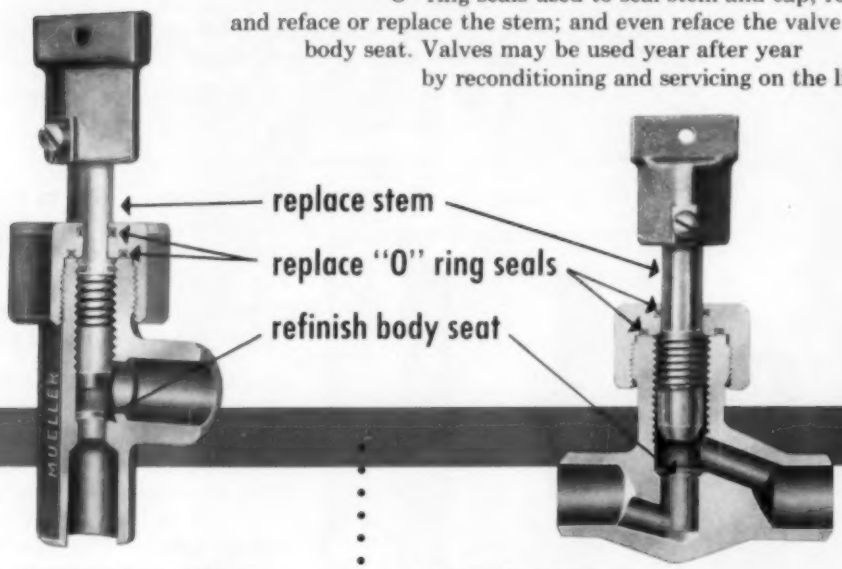
CEMENTING SERVICES

284 SERVICE CENTERS — JUST MINUTES AWAY FROM ANY WELL

recondition and repair MUELLER® steel valves

...under pressures up to 1200 p.s.i.

Mueller high pressure NO-BLO® Steel Valves and Curb Valve Tees may be quickly and completely reconditioned and repaired under pressure. With the use of proper equipment, you can easily remove and replace "O" ring seals used to seal stem and cap; remove and reface or replace the stem; and even reface the valve body seat. Valves may be used year after year by reconditioning and servicing on the line.



H-17800 NO-BLO CURB VALVE TEE OR ANGLE VALVE

Welding or threaded inlet—sizes ¾" through 2". Welding, threaded, extended, Dresser or insulating outlet—sizes ¾" through 2½".

H-17900 NO-BLO STEEL VALVE

Welding or threaded inlet and outlet or any combination—sizes ¾" through 2".

H-17801 NO-BLO EXTENDED CURB VALVE TEE

Extended welding inlet for use with reinforcing saddle—size 2" only.

Cone-shaped 1" welding outlet for use with 1", 1¼", 1½" and 2" pipe.

NO-BLO

Write for complete information on these valves and other No-Blo fittings and equipment.

Since 1857

MUELLER CO. 100th YEAR SERVING the Waterworks Industry QUALITY

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

Deep in the Earth There's Another Reason Layne's on Top!

THE LAYNE IMPELLER is that reason, because a pump can be no better than its impeller.

There are two main considerations in impeller evaluation—QUALITY AND PERFORMANCE.

QUALITY—The materials used in the manufacture of a Layne impeller must be tough, durable and possess excellent *surface quality* and they must be able to insure *dimensional accuracy*. Metal patterns are used in casting high quality phosphor gear bronze into Layne impellers. Other special metals are specificed when necessary.

PERFORMANCE—A Layne impeller is correct in hydraulic design based on 75 years of Layne experience through thousands of successful installations and tests. Correct impeller design determines a pump's performance in any particular hydraulic condition.

Each Layne impeller is precision manufactured. Because no one technique is adequate, both hand finishing and special machining are used in balancing and tooling the impeller. Working to a rigid and minimum tolerance, specially designed gauges and instruments check each step to the finish of a Layne impeller . . . from water passages and angles to vane thickness.

Layne Impeller sizes range from 4" diameter and up, as specified.

The result — an impeller which operates deep in the recesses of the earth dynamically in balance. Each remaining component part of a Layne pump receives the same careful engineered attention, and when assembled assures complete pump perfection giving you years of trouble-free service.

Layne's 75 years of experience puts Layne on top!

1882 — 1957
Layne
75 YEARS OF PROGRESS

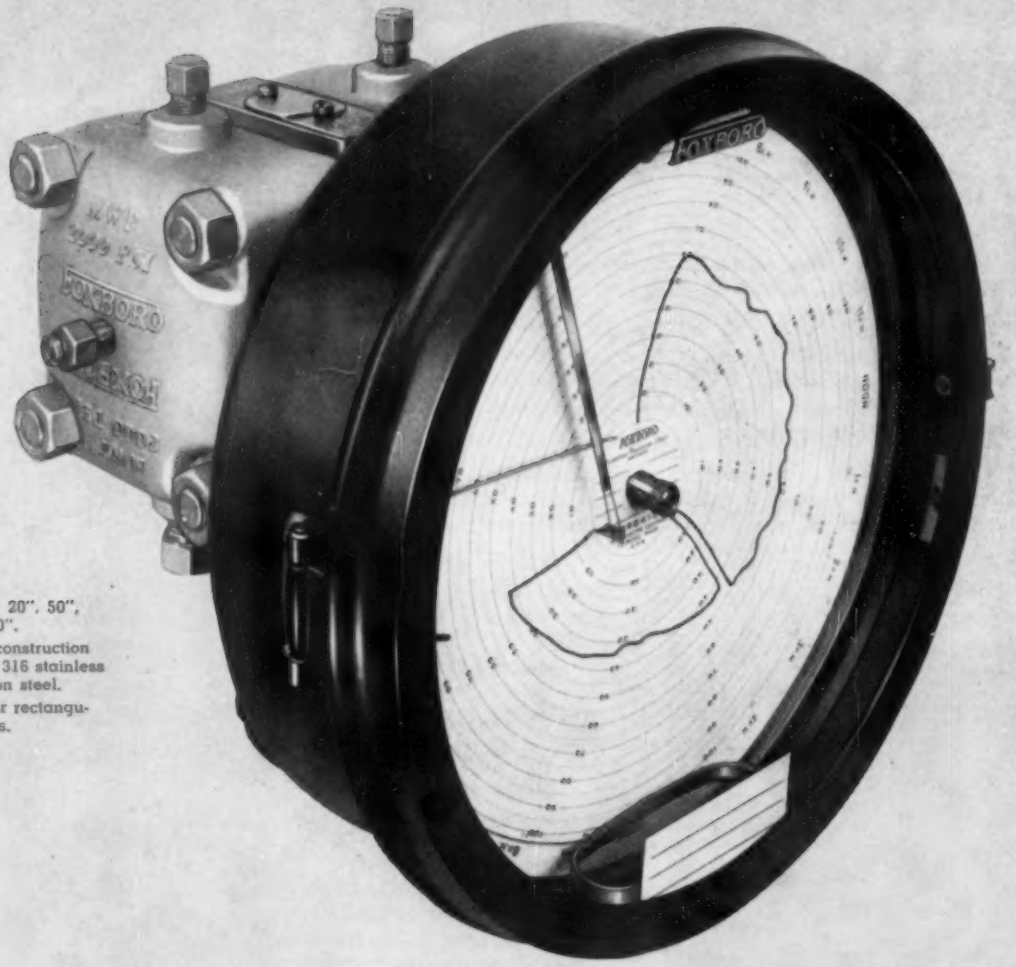
WATER WELLS • VERTICAL TURBINE PUMPS • WATER TREATMENT

LAYNE & BOWLER, INC. MEMPHIS

General Offices and Factory • Memphis 8, Tennessee

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

NOW... a "Dry" Flow Meter with..

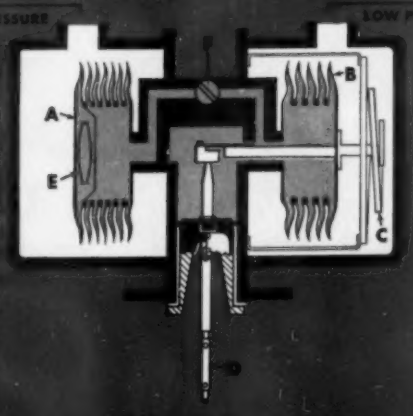


- Ranges: 20", 50", 100", 200".
- Forged construction in Type 316 stainless or carbon steel.
- Round or rectangular cases.

..the new Foxboro Type 37 Diaphragm Meter

How It Works

In schematic drawing at right, areas shown in color represent a stable, non-freezing liquid. Any pressure increase in the high pressure chamber compresses Diaphragm Unit A, displacing its liquid and expanding Diaphragm Unit B until force of Range Spring C equals the difference between the forces on Diaphragm Units A and B. Linear motion of Diaphragm Unit B moves inner end of Drive Bar D — outer end moves correspondingly through the bellows-sealed flexure bar, driving pen arm. Built-in Temperature Compensator (E) proportionately adjusts diaphragm capacity as ambient temperature variations affect volume of filling fluid. External damping adjustment is shown at F.



• *complete overrange protection!*

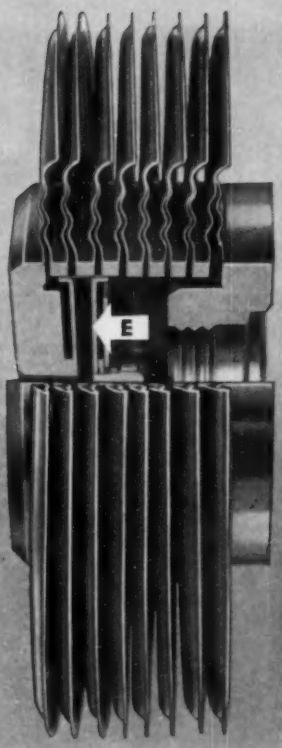
• *sustained high accuracy!*

Now you can have mercuryless flow measurement for a wide range of differential pressures — at static pressures up to 2000 psi — with greater safety and dependability than ever before! The new Foxboro Type 37 Diaphragm Meter not only combines unmatched ruggedness and precision in a dry meter — it's by far the easiest to adjust and maintain. And it does away with zero drift problems, once and for all! Expansible, Type 316 S.S. diaphragm elements respond to changes in pressure with unmatched sensitivity, yet are completely immune to overrange up to full static pressure! A unique packless drive bar precisely transmits linear motion to the pen arm. Range-changing is easy, due to new twin-spiral spring design. Wide range damping is externally adjustable under pressure. And the Type 37 is self-compensating for temperature changes in all differential ranges. Get full details on this high utility, completely dependable dry flow meter. Arrange for a demonstration with your nearby Foxboro Field Engineer, or write The Foxboro Company, 6012 Neponset Ave., Foxboro, Mass., U.S.A.

FOXBORO

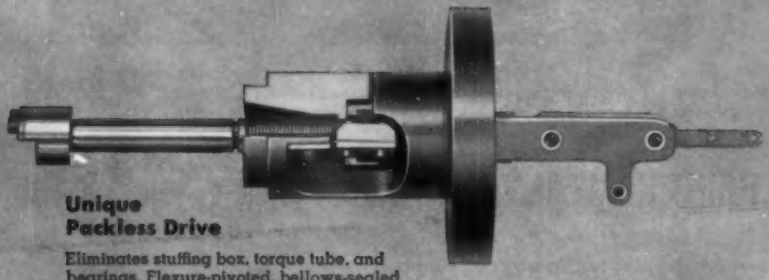
REG. U.S. PAT. OFF.

FIRST IN FLOW METERING



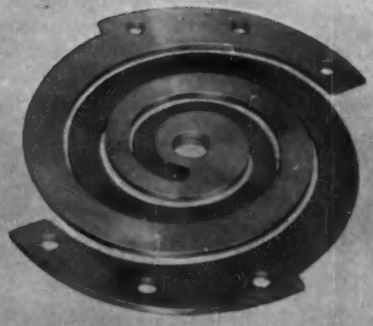
Exclusive Diaphragm Elements

Type 316 S.S. diaphragm units in both high and low pressure chambers provide greatest linearity and freedom from hysteresis; nesting design and integral spacer rings provide safe, positive, overrange protection. Temperature compensation (E) is built into diaphragm assembly . . . never requires change or adjustment.



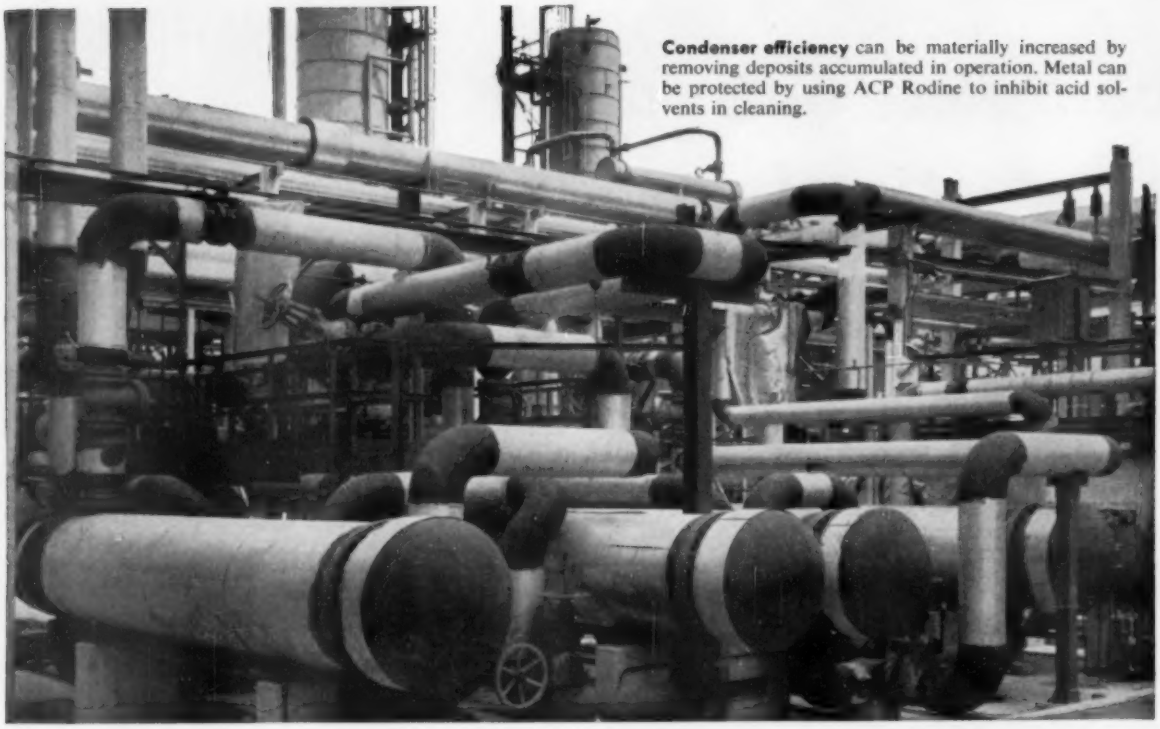
Unique Packless Drive

Eliminates stuffing box, torque tube, and bearings. Flexure-pivoted, bellows-sealed drive bar transmits diaphragm's linear motion to the pen arm with unequalled sensitivity *and undiminished* power. Seal for flexure pivot is a tough, flexible bellows.



Exclusive Range Springs

Heavy gauge Ni-Span C alloy, twin-spiral springs provide high sensitivity with lasting accuracy. Readily accessible . . . range changes are easily made, in minutes!

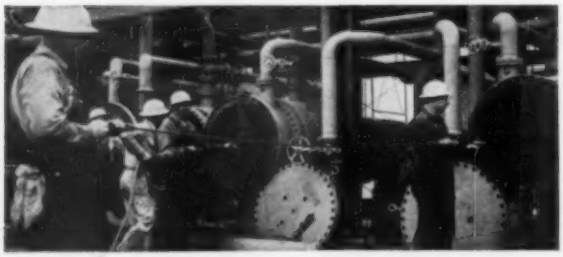


Condenser efficiency can be materially increased by removing deposits accumulated in operation. Metal can be protected by using ACP Rodine to inhibit acid solvents in cleaning.

ACP Rodine® INHIBITS THE ACID SOLVENTS USED IN THE CLEANING OF INDUSTRIAL EQUIPMENT, TANKS AND PIPING SYSTEMS

Make sure that your equipment is protected against acid attack during cleaning—specify ACP Rodine for inhibiting the acid solvents used to dissolve and disintegrate the troublesome deposits which reduce the efficiency of boilers, heat exchangers, cooling systems, condensers, etc. ACP Rodine is water soluble, liquid foaming—a strong inhibitor and a strong detergent. It provides an excellent safeguard with most acid solvents used in industrial cleaning operations. Rodine can be advantageously applied in any type of carbon or low-alloy steel equipment.

Write for complete information today. And remember our technical sales engineers will be glad to discuss your problems with you, and make specific recommendations.



Manual cleaning operations—like the one shown above—require more labor, take more time, are much less effective than chemical cleaning with ACP Rodine-inhibited solvents.

ACP Rodine is also used to inhibit corrosion in sweet wells, condensate wells, and secondary recovery operations. It's economical, too, costs only pennies a day.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 39, Pa.

CHEMICALS ACP PROCESSES

DETROIT, MICH. • ST. JOSEPH, MO. • NILES, CALIF. • WINDSOR, ONT.

New Chemical Horizons for Industry and Agriculture

are you pumping red tape?

If you are there's no quick, easy solution to your problem. But an answer must be found. The red tape of oil operation can choke production as surely as a well that is sanding up. These higher operation costs can cut your profit to the point that you are working only for your creditors.

Although you have no control over your sales price, you can control your costs. Working with your legal and tax counsel, The Commerce can analyze your costs, find where economies can be effected, thereby increasing the profitableness of your operation by helping you to cut your costs. Your income goes up when you stop pumping red tape.

Facilities of The National Bank of Commerce Oil Loan Department are available in Wyoming, Nebraska, Colorado, New Mexico, Texas, Louisiana, and Mississippi.

E. O. Buck, vice president, Oil Loan Department

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

THE NATIONAL BANK OF

COMMERCE

OF HOUSTON

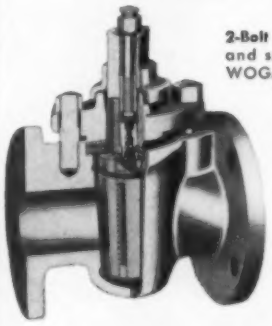
Gulf Building, Houston, Texas

Cut flow control costs... standardize on...

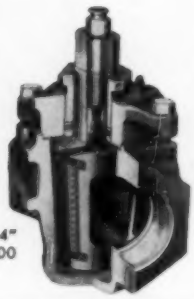
THE WORLD'S MOST COMPLETE

LUBRICANTS and

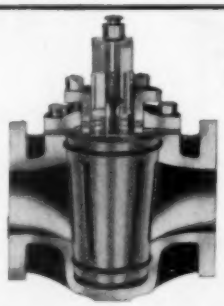
VALVES



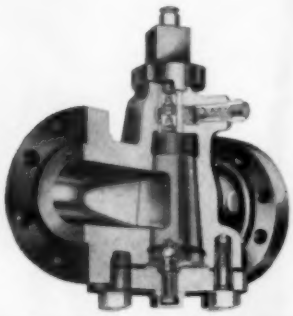
2-Bolt Cover Type Valve in 4" and smaller sizes for 175-lb WOG. *Semi-Steel*



Screwed Gland Type Valve in 4" and smaller sizes for 200, 400 and 500-lb WOG. *Semi-Steel*



Bolted Gland Type Valve in 4" to 36" for 200 through 800-lb WOG Semi-Steel and ASA 150-lb and 300-lb Carbon Steel.

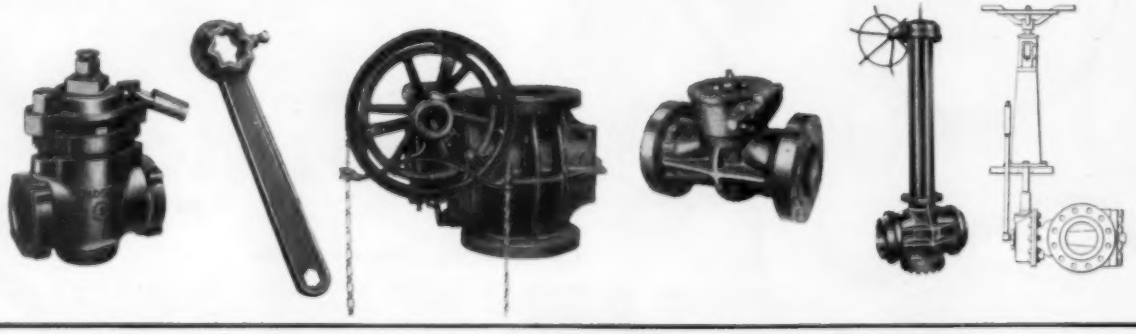


Hypreseal Valve—Bolted Bottom Cover Type. ½" to 30 by 34" for ASA 150-lb through 1500-lb Carbon Steel (with rectangular opening). API 2000-lb and 3000-lb WOG Alloy Steel Rectangular Opening. API 2000 and 3000-lb WOG Alloy Steel (with round opening).

LUBRICANTS

PROPER VALVE LUBRICATION means longer valve life and better performance at lower cost. Rockwell is the world's oldest and most experienced manufacturer of lubricated plug valve lubricants. To assure perfect performance, a *complete line* of lubricants has been developed and field proved. For convenience, they are available in stick, tube and bulk forms. The Rockwell High Pressure Booster Type Hand Gun and Rockwell High Pressure Booster Type Bucket Gun make the lubrication of even a great number of valves a job that takes only minutes.

ACCESSORIES

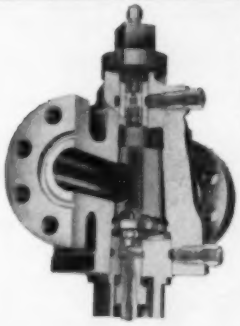


GREATER DESIGN AND INSTALLATION FREEDOM are the "extras" you get when you specify Rockwell-Nordstrom valves and accessories. No matter what your operating requirements or problems, you can select from a *complete* line of valve accessories that assure easier, safer, more efficient operation.

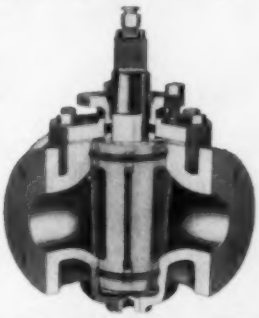
While only a few of the valve accessories are shown above, you can learn about the complete selection by talking with your Rockwell-Nordstrom sales engineer or writing directly to: Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pennsylvania.

LINE OF LUBRICATED PLUG VALVES,

ACCESSORIES



Hypreseal Valve—Screwed Bottom Cover Type. ½" to 8" for 7500-lb WOG Alloy Steel (rectangular opening). ASA 2500-lb Carbon Steel (rectangular opening). API 5000-lb and 10,000-lb WOG (rectangular opening) and API 5000-lb and 10,000-lb WOG (round opening).



Multiport Valve Type. Available in Gland type and Hypreseal type in WOG pressures to 400 lb and ASA pressures to 1500-lb. Sizes from ½" to 24".

ALL THESE ADVANTAGES
In *Every* Rockwell-Nordstrom Valve.

LEAKPROOF: Lubricant sealing is a *double* seal against leakage.

LONG-LIFE: Lubricant prevents metal-to-metal wearing friction.

LOW-COST: Lubrication is preventive maintenance.

DEPENDABLE: Hydraulic lubricant action jacks plug for instant operation.

QUARTER-TURN OPERATION: 90° turn for *full* positive shut-off.

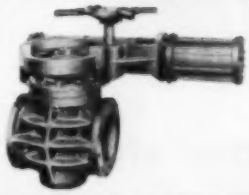
SMOOTH PASSAGE: Straight-through flow without crevices . . . minimum pressure drop.

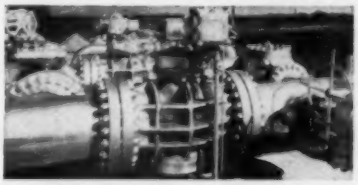
UNEXPOSED SEATS: Corrosion and erosion eliminated in vital seat areas.

ADJUST, LUBRICATE UNDER PRESSURE: Never down time for routine servicing.

No other valve—at any price—can offer the performance and longer life at lower cost of Rockwell-Nordstrom valves.

POWER OPERATORS





AUTOMATIC VALVE OPERATION is more dependable and economical when you specify Rockwell-Nordstrom valves. They are far superior to ordinary valves for power operation because *lubrication* reduces operating torque—smaller, less costly actuators can be used. And since there are no forced, wedged seats to be set, the actuator has only to move the lubricated plug through 90°.

Typical electric, pneumatic and cylinder operators shown above represent only three of the more than fourteen power operation arrangements available.

VALVES WITH SPECIAL FEATURES

NO MATTER WHAT YOUR NEEDS, there is a Rockwell-Nordstrom valve that will do the job better, longer and at lower cost. A few of the Rockwell-Nordstrom valves with special features are shown above.

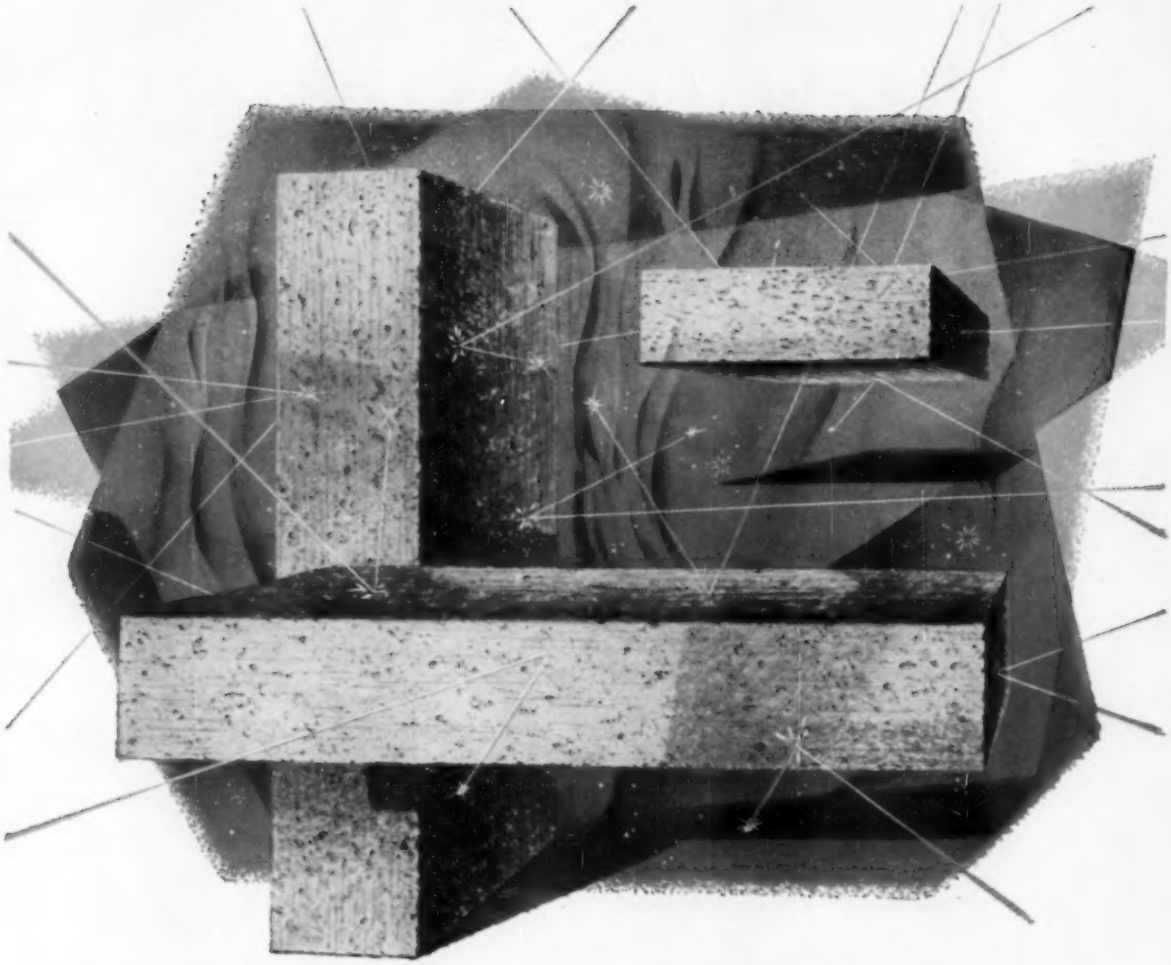
Special metal valves are available in stainless-steel, bronze and other corrosion resisting alloys for even the toughest services. Valves with *hard faced plugs and bodies* combine the economy of semi-steel with hard facing for utmost corrosion and wear resistance. *Steam jacketed valves* for precise product temperature control. *By-pass relief valves* prevent pressure build-up that imposes dangerous stress on ordinary valves and fittings. *Gas safety control (Factory Mutual) valves* for positive control against explosion in multi-burner gas-fired furnaces, ovens and driers.

• • • •

Rockwell-Nordstrom valves and accessories are available at leading oil field and industrial distributors everywhere. For full information write: Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom **VALVES**

Lubricant Sealed For Positive Shut-off



Go ahead! Raise process temperatures

. . . refractories fortified with Alcoa Aluminas can take it

Process temperatures continue to climb in industry's constant effort to raise production and product quality while cutting costs. That makes more important than ever the role of ALCOA® Aluminas in fortifying refractories. To see why, study these performance facts:

As alumina content of a refractory increases . . .

- **strength and stability under load at high temperatures increase**
- **there is less spalling, abrasion and fluxing**
- **co-efficient of expansion decreases**
- **resistance to chemical attack improves**
- **effective service life grows longer and longer**

For users of high alumina refractories, the money-making results are these: less downtime . . . less rebuilding . . . longer continuous equipment operation under uniform conditions to raise production tonnages and maintain product quality . . . easier product development.

First cost of high alumina refractories is surprisingly low, too . . . because ALCOA Aluminas are among the least costly, *uniformly pure oxides* available in quantity and suitable for refractory use.

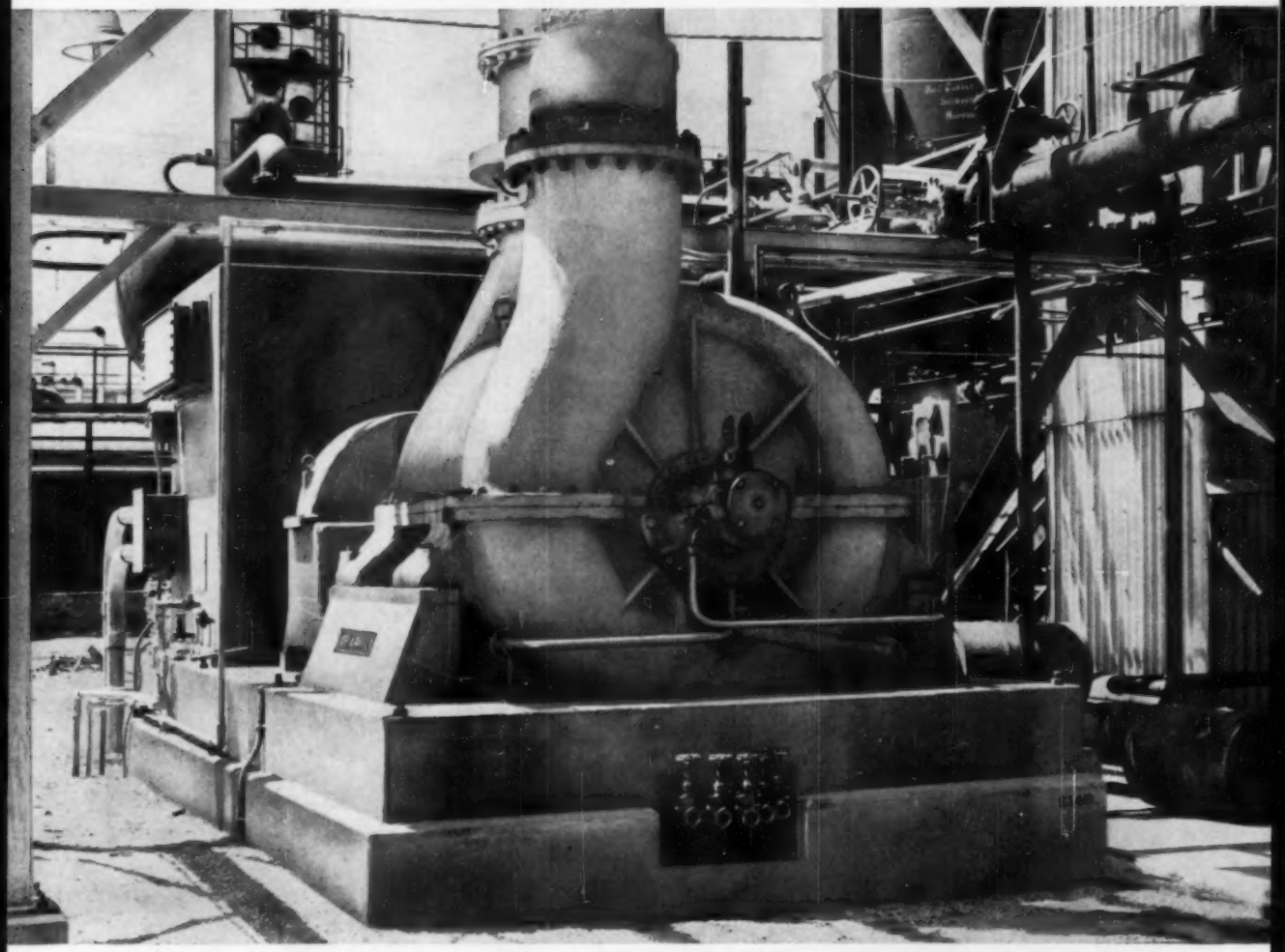
Look at it as you will! Refractories fortified with ALCOA Aluminas are *your* best answer to the plaguing problems of suitable refractory performance in today's super-high temperature operations.

ALCOA does not make refractories! We will gladly refer you to a reliable supplier who uses ALCOA Aluminas to make *better* refractories. For additional information, write ALUMINUM COMPANY OF AMERICA, 715-M Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA CHEMICALS
ALUMINUM COMPANY OF AMERICA

NEW!
"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

Another **DE LAVAL** *combustion air compressor dependably serves refinery cat cracker*



On stream at the Coffeyville, Kansas plant of the Cooperative Refinery Association, this De Laval Centrifugal Compressor delivers 24,100 cfm of air. Inlet pressure is 14.0 psia, discharge pressure 38.9 psia. Compressor output is controlled with adjustable inlet guide vanes.

This De Laval main air compressor is driven by a 2500 hp, 1800 rpm motor. Shaft speed is increased to 4800 rpm through a De Laval double helical speed increasing gear.

Cooperative Refinery Association is only one of many refiners who have specified De Laval Compressors. Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval. Rugged De Laval centrifugal compressors perform dependably in heavy-duty continuous operation. De Laval has more than 40 years of experience in solving gas compression problems.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL-393

Here's why Twin Disc Air Clutches are used in new open crown rig

When Skytop Rig Company, Victoria, Texas, developed its new Welter Weight Rig—an open crown oil well servicing rig which permits pipe to be pulled to a height limited only by the number of joints that will stand erect — company engineers knew that every component of the rig would have to meet the most rigid requirements for unusually severe operations.

When it came to clutch selection, Skytop turned to Twin Disc. The Welter Weight Rig standardizes on one Twin Disc Model PO-224 Air Clutch, two PO-218 Air Clutches and a PO-214 Air Clutch (along with a Twin Disc Model CL Mechanical Clutch and a Twin Disc Torque Converter).

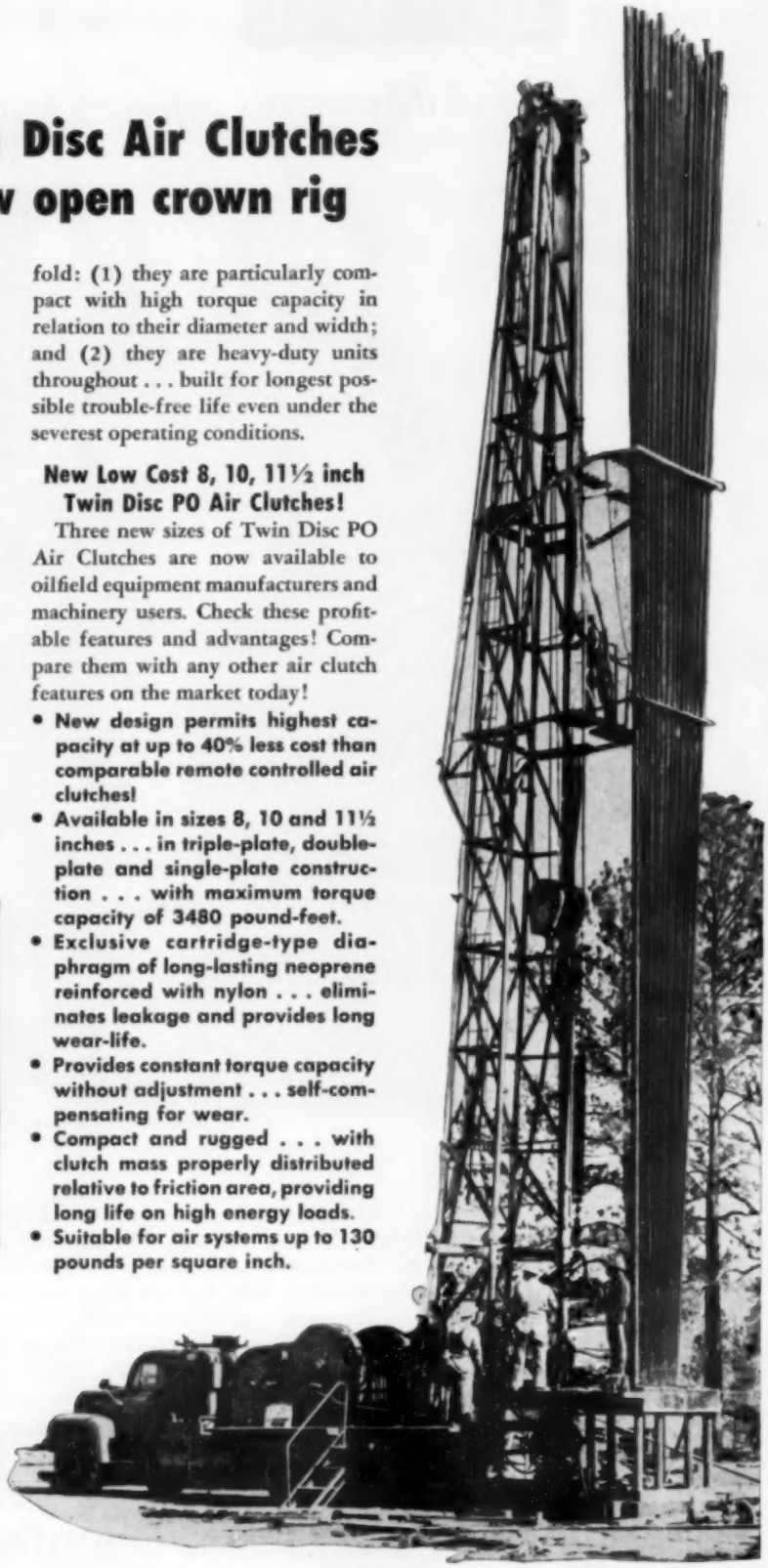
The reason Skytop selected the Twin Disc PO Air Clutches is twofold: (1) they are particularly compact with high torque capacity in relation to their diameter and width; and (2) they are heavy-duty units throughout . . . built for longest possible trouble-free life even under the severest operating conditions.

Twin Disc PO Air Clutch

New Low Cost 8, 10, 11½ inch Twin Disc PO Air Clutches!

Three new sizes of Twin Disc PO Air Clutches are now available to oilfield equipment manufacturers and machinery users. Check these profitable features and advantages! Compare them with any other air clutch features on the market today!

- **New design permits highest capacity at up to 40% less cost than comparable remote controlled air clutches!**
- **Available in sizes 8, 10 and 11½ inches . . . in triple-plate, double-plate and single-plate construction . . . with maximum torque capacity of 3480 pound-feet.**
- **Exclusive cartridge-type diaphragm of long-lasting neoprene reinforced with nylon . . . eliminates leakage and provides long wear-life.**
- **Provides constant torque capacity without adjustment . . . self-compensating for wear.**
- **Compact and rugged . . . with clutch mass properly distributed relative to friction area, providing long life on high energy loads.**
- **Suitable for air systems up to 130 pounds per square inch.**

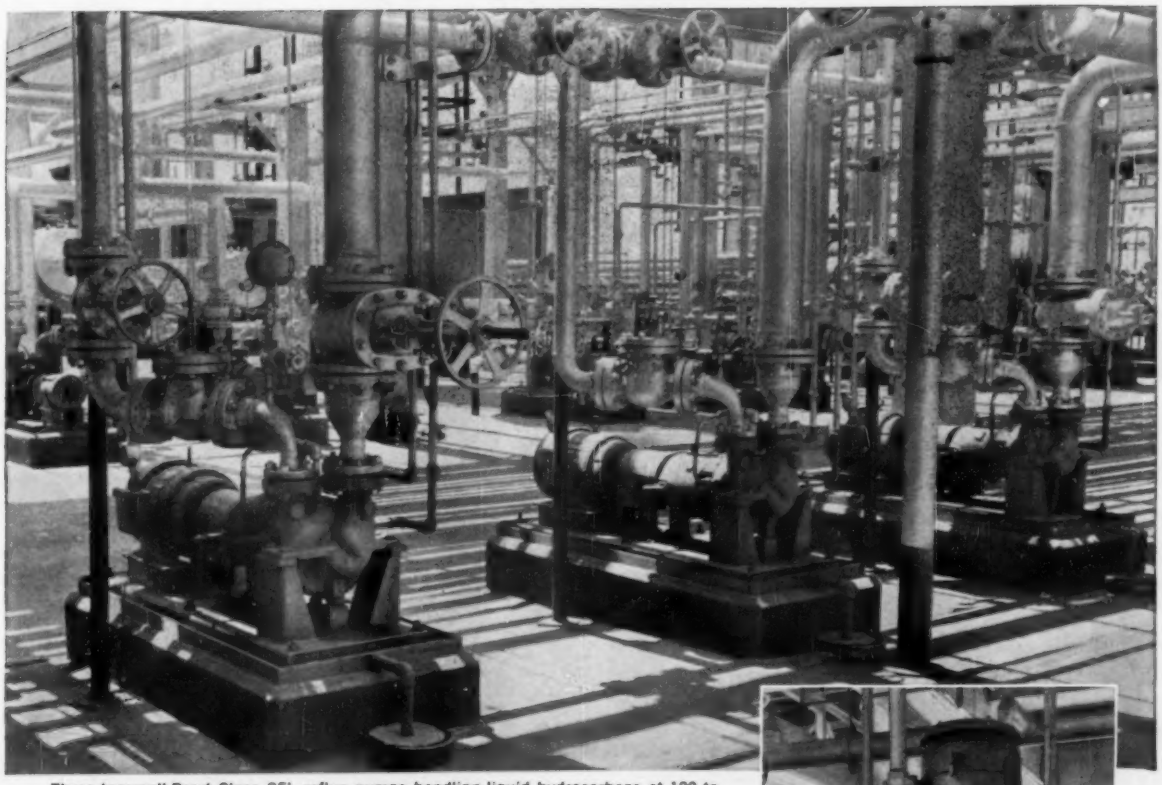


TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, RACINE, WISCONSIN, (Hydraulic Division, Rockford, Illinois)



Three Ingersoll-Rand Class SFL reflux pumps handling liquid hydrocarbons at 100 to 110 gpm for new reforming unit at Cosden refinery.

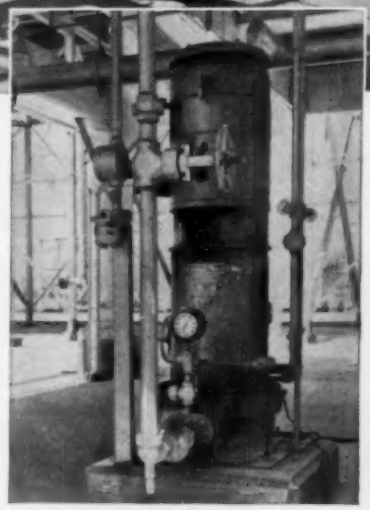
REFLUX PUMPS

at Cosden Rexformer Unit

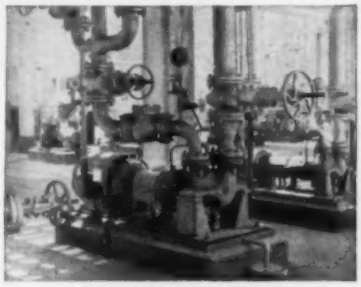
Ingersoll-Rand Centrifugals handle "vital fluids" for new Rexformer Unit at large Texas refinery

HERE AT the Big Spring Refinery of Cosden Petroleum Corporation, thirty Ingersoll-Rand centrifugals have the important job of pumping the "life blood" for the new U.O.P. designed Rexforming Unit. In addition to the reflux pumps shown here, other I-R pumps are in circulating, transfer and charge service — all performing functions vital to sustained operation of the reforming process.

Here at Cosden — as in major refining and processing plants all over the world — the dependability, efficiency and low maintenance of Ingersoll-Rand pumps contribute to the economy and trouble-free performance of the entire plant. For a *fast solution* to your pumping problems, just call your nearest I-R Branch Office.



Ingersoll-Rand 25-hp Class VP vertical extraction reflux pump handling hydrocarbon stock at 55 gpm.



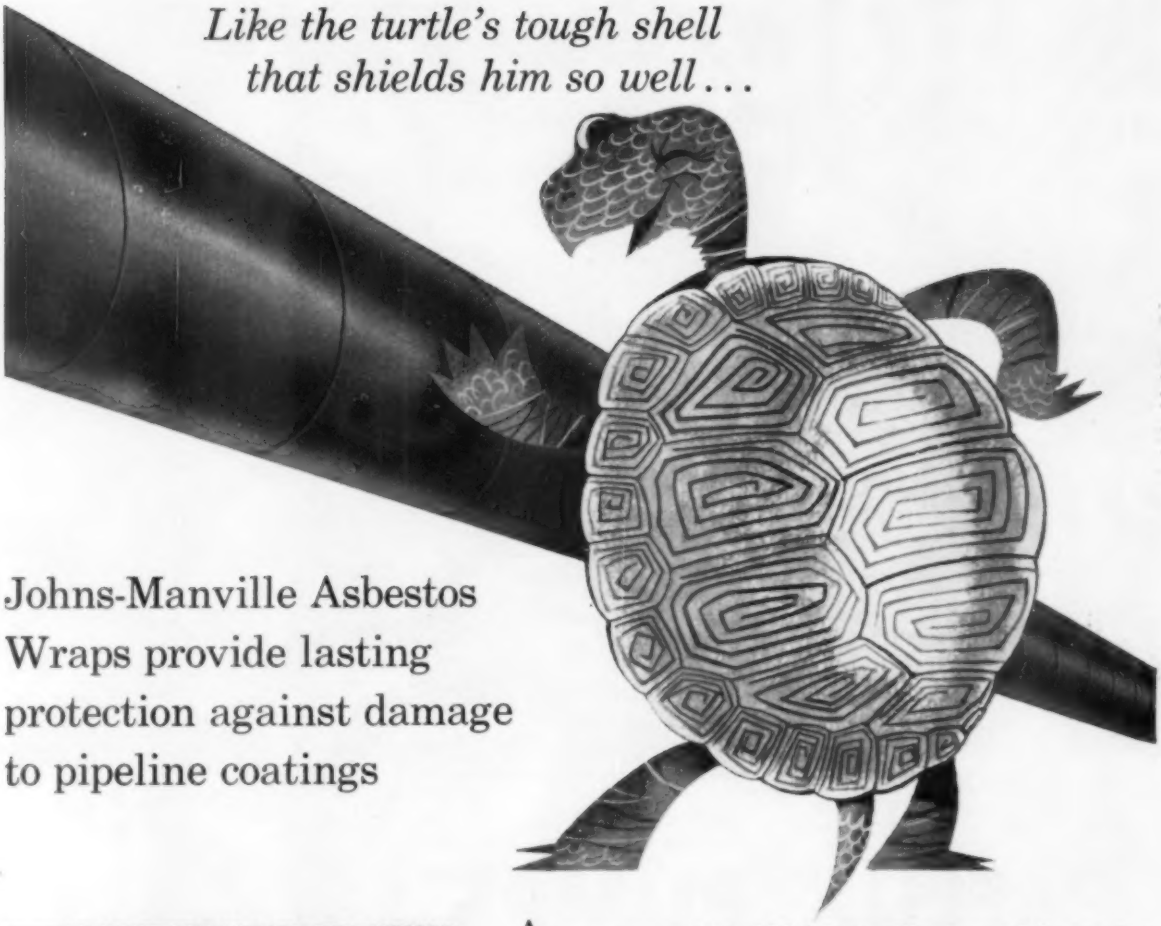
Two Ingersoll-Rand Class MFL stripper column reflux pumps, each rated 390 gpm.

Ingersoll-Rand

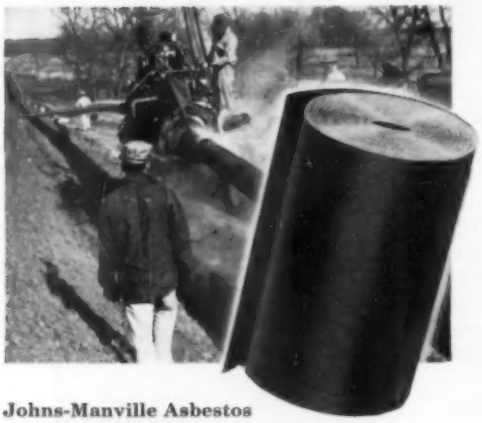
10-691 11 Broadway, New York 4, N. Y.

PUMPS • COMPRESSORS • DIESEL ENGINES • AIR & ELECTRIC TOOLS • TURBO BLOWERS • CONDENSERS

Like the turtle's tough shell that shields him so well...



Johns-Manville Asbestos Wraps provide lasting protection against damage to pipeline coatings



Johns-Manville Asbestos Felt is available in 3 types for field application or mill wrapping:

#15 Asbestos Felt—the high-strength, uniform asbestos wrap that has given superior protection to pipe coatings for more than 30 years—under the most severe soil conditions.

#15 Transhield®—heavyweight asbestos felt with parallel glass reinforcement for high tear strength.

#8 Transhield—standard-weight asbestos felt with parallel glass reinforcement—for low-cost protection against average soil conditions.

As far back as 1915, J-M Asbestos Wraps were being used to protect pipeline coatings. As a matter of fact, in the early twenties Johns-Manville also played a leading role in the development of equipment for mechanically applying protective coatings and wraps at the same time. The introduction of this equipment brought about uniform application of coatings and wraps . . . prolonged the effective life of protected pipelines.

Today, Johns-Manville Asbestos Wraps have a performance record of over forty years on job-proved installations representing nearly a quarter of a million miles of pipeline. And tests made recently by a leading firm of consulting engineers showed Asbestos Wraps provide the most effective single protection against earth loads, soil stress and other forces that weaken coatings and permit corrosion of the pipeline.

Invite one of our engineers to show you why J-M Asbestos Wraps have been the standard for the industry—and while he is with you, ask him to let you see the results of a three-year, extensive test program of "Pipeline Coatings and Wrappers." Write to Johns-Manville, Pipe Division, 22 E. 40th St., New York 16, N. Y.

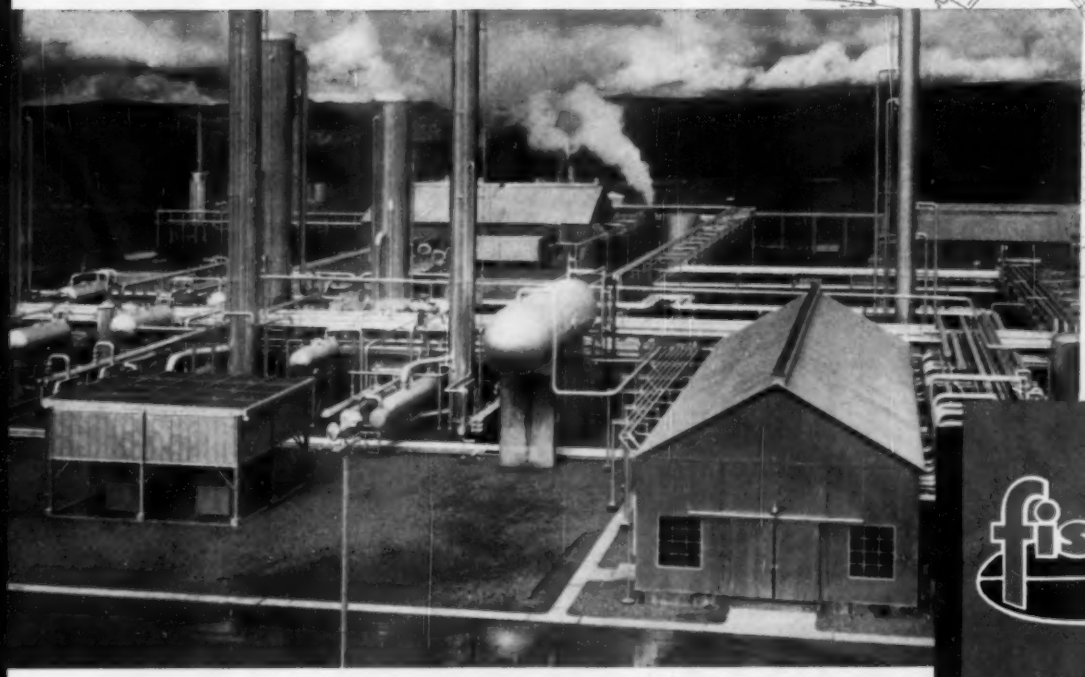
STRONG PROTECTION ✓ PROVEN PERFORMANCE
RESISTANCE TO SOIL STRESS AND DEFORMATION
HIGH-SPEED APPLICATION • LONG-TERM INVESTMENT
SIMPLIFIES CATHODIC PROTECTION SYSTEMS
REDUCES HAZARD • INCREASES SAFETY

JM PRODUCTS

JOHNS-MANVILLE

This gasoline plant operates efficiently despite

varying loads



The San Juan gasoline plant of the Pacific Northwest Pipeline Corporation is big! It was designed to handle 300 million cubic feet of gas per day and recover 340,000 gallons of liquids. But efficient operation over a wide range of loads was necessary.

Since it was placed on stream in October, 1956, the San Juan plant has operated efficiently and dependably at loads ranging from 20 per cent to nearly 100 per cent of capacity. This is an unusual record for a plant of this size.

Furthermore, because of a rigid timetable imposed by pipeline commitments, the plant was constructed in record time despite many unusual problems posed by terrain, weather and transportation.

Because of transportation limitations, the 90-inch by 56-foot absorbers had to be shipped to the site in sections. There, welding assembly was completed in the field. The units were then inspected and stress-relieved.

This is just one example of the way the Fish Companies tackle problems. Your problem may be entirely different.

If you are planning new facilities in oil, gas or chemicals, call on Fish for imaginative engineering . . . from feasability study to final completion.

the fish companies

HOUSTON

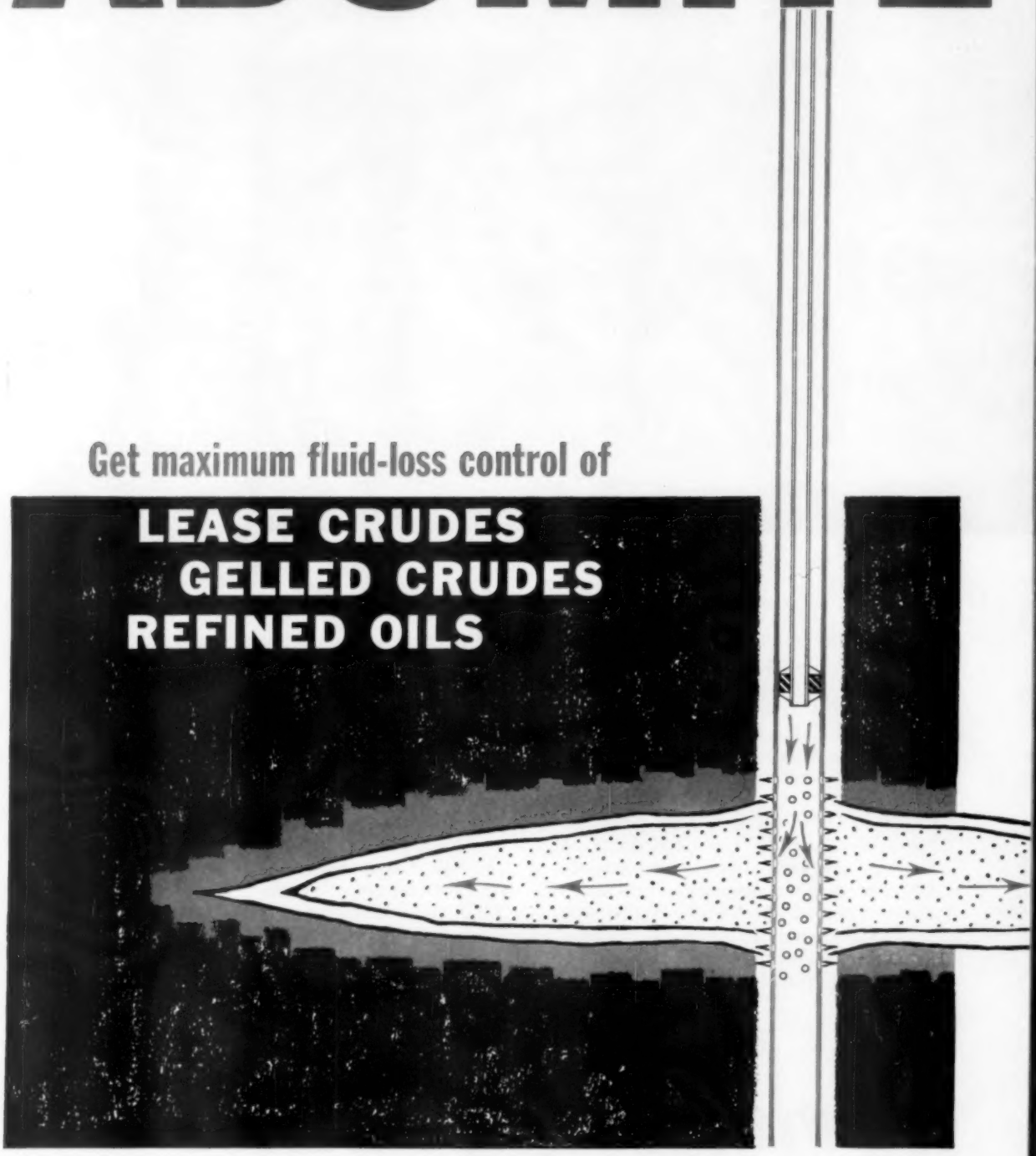
FISH ENGINEERING CORPORATION
FISH NORTHWEST CONSTRUCTORS, INC.
FISH SERVICE CORPORATION

Beginning with your next fracture job,

ADOMITE®

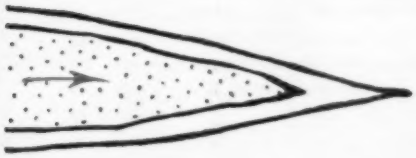
Get maximum fluid-loss control of

LEASE CRUDES
GELLED CRUDES
REFINED OILS



can get you ...MORE DOLLARS DOWNHOLE

You can bank on Adomite for more productive fracturing and to minimize fluid loss under exacting conditions downhole. Fluid-loss control tests demonstrate the deep-down effectiveness of Adomite . . . with fluid loss reduced to 10cc. In more than 10,000 field treatments, in every type of formation, Adomite has paid off big. It's understandable why more and more producers are *standardizing on Adomite.*



Best bet at bottom hole . . . millions of tiny Adomite particles temporarily seal the fracture face . . . minimize fluid loss . . . without damaging the formation.

Longer fractures . . . deeper penetration of sands.

Fewer sandouts . . . reduces fluid loss in rock matrix, prevents buildup of sand concentrations in the fractures.

Saves you money . . . utilizes your own lease crudes . . . saves transportation costs.

Decreases friction loss . . . low viscosity of Adomite-created fracturing fluids permits use of less pumping equipment than with viscous refinery residuals.

Reduces hazard of emulsions . . . emulsion-breaking characteristics are important consideration to many producers.

Adaptable to virtually all types of crude, Adomite is all you need to control fluid loss of kerosene, crudes, gelled crudes or refinery residuals.

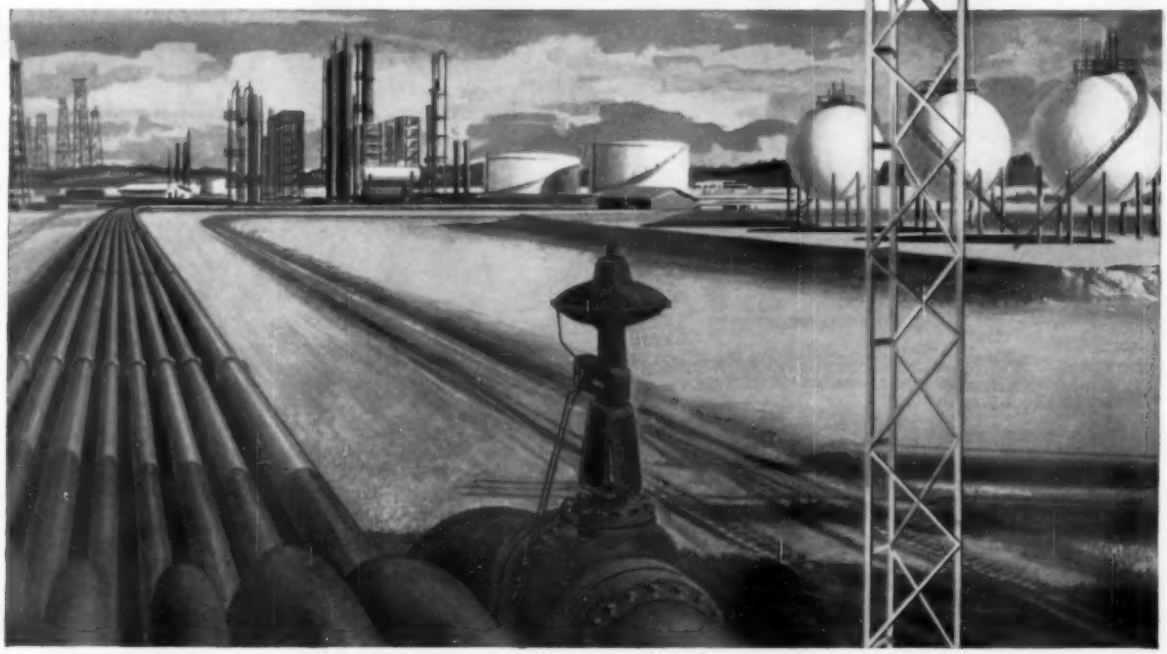
Specify Adomite in your next fracture job—Producers who say Adomite . . . stay with Adomite.

©1957, Continental Oil Company

Fracture with ADOMITE

IN PIPELINE MICROWAVE
ONLY THE BEST WILL DO . . .

PIPELINERS WHO KNOW CHOOSE PHILCO!



Philco Microwave Delivers Outstanding System Reliability, Economy of Installation and Operation, Simplified Equipment Maintenance!

Philco microwave is proving itself in a growing number of pipeline applications. With 240 channel baseband capacity for telephone, telemetering and remote control—including reserve capacity for high-speed computer data transmission—Philco microwave fills both immediate and long-range requirements of modern pipeliners.

Semiconductor rectifiers replace conventional tubes in the new Philco heavy duty tubeless power supplies, assuring minimum maintenance and significant reductions in operating costs. Printed wiring panels increase circuit stability, simplify field maintenance. Klystrons are cooled by convection—compact heat sinks eliminate the need for bulky blowers.

Here is reliability of performance unaffected by severe weather, free from the many limitations of wire and pole line construction, unhampered by problems of difficult terrain, over-water transmission or expensive rights-of-way.

Philco engineers will be happy to help with your special microwave requirements. Please contact us for further information. Look ahead . . . and you'll choose PHILCO.

PHILCO®

Government & Industrial Division
Philadelphia 44, Pennsylvania
In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

Engineering Progress Report
FROM UNION CARBIDE CHEMICALS COMPANY

Side Stream Distillation Reduces Cost of Gas Sweetening Operations

Control monoethanolamine contamination by eliminating foreign materials

Monoethanolamine reacts with weak acids such as hydrogen sulfide and carbonic acid at ambient temperatures to form salts. Then, these salts decompose when heated to the boiling point of water, liberating the acidic gases and freeing the monoethanolamine for recirculation to pick up more acid gas. This provides an economic cyclic process for absorbing these undesirable materials from a gas stream. Because of this, practically all gas sweetening in the United States is accomplished by means of the ethanolamines. Union Carbide Chemicals Company's Technical Service Department is continually engaged in research designed to give better engineering service to users of CARBIDE's ethanolamines.

MOST UNITS ARE TROUBLE-FREE

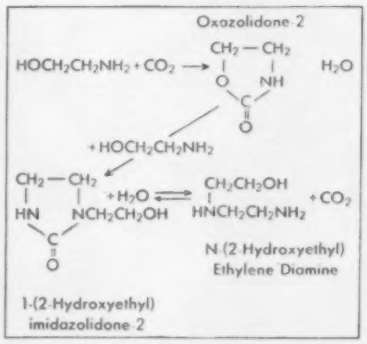
Most of these plants have operated for years without difficulty. However, experience with both aqueous-amine and glycol-amine solutions shows that in some plants the solution gradually loses capacity to absorb acidic gases and may become corrosive.

Research has shown that monoethanolamine contamination can be controlled by a simple side stream distillation system which removes foreign materials and amine degradation products. Thus, sewering can be avoided.

FORMATION OF AMINE DERIVATIVES

Examination of used aqueous and glycol-amine solutions led to the isolation and identification of two monoethanolamine conversion products, namely, 1-(2-hydroxyethyl) imidazolidone-2 and N-(2-hydroxyethyl) ethylene diamine.

It was found that this reaction actually takes place at a very slow rate in some plants handling carbon dioxide. A similar reaction



yielding similar products does not occur when only hydrogen sulfide is present.

EFFECT OF AMINE DERIVATIVES

Formation of imidazolidone reduces the effective monoethanolamine concentration and increases solution viscosity. High concentration may aggravate precipitation of residues in equipment. N-(2-hydroxyethyl) ethylene diamine will pick up acid gases, but release them only with difficulty. The acid gas salt of this stronger amine may contribute to plant equipment corrosion.

DEGRADATION PRODUCTS REMOVED BY SIDE STREAM DISTILLATION

Commercial experience proves that it is possible to remove the imidazolidone from fouled plant solutions by side stream distillation at atmospheric pressure. Batch-wise operation handling approximately 1 per cent of the circulated solution has been successful. Vacuum distillation equipment has been equally successful in the case of glycol-amine solutions.

While the substituted ethylene diamine can be efficiently removed in aqueous monoethanolamine systems, it can not be removed from diethylene glycol-monoethanolamine mixtures as its boiling point is within a few degrees of that of diethylene glycol.

However, the imidazolidone and diamine are in equilibrium. Therefore, reduction of the imidazolidone concentration causes the diamine to revert to imidazolidone. This results in an ultimate removal of both the imidazolidone and the diamine.

In addition, side stream distillation also removes inorganic salts, organic materials with boiling points higher than monoethanolamine, and heat stable monoethanolamine-acid reaction products.

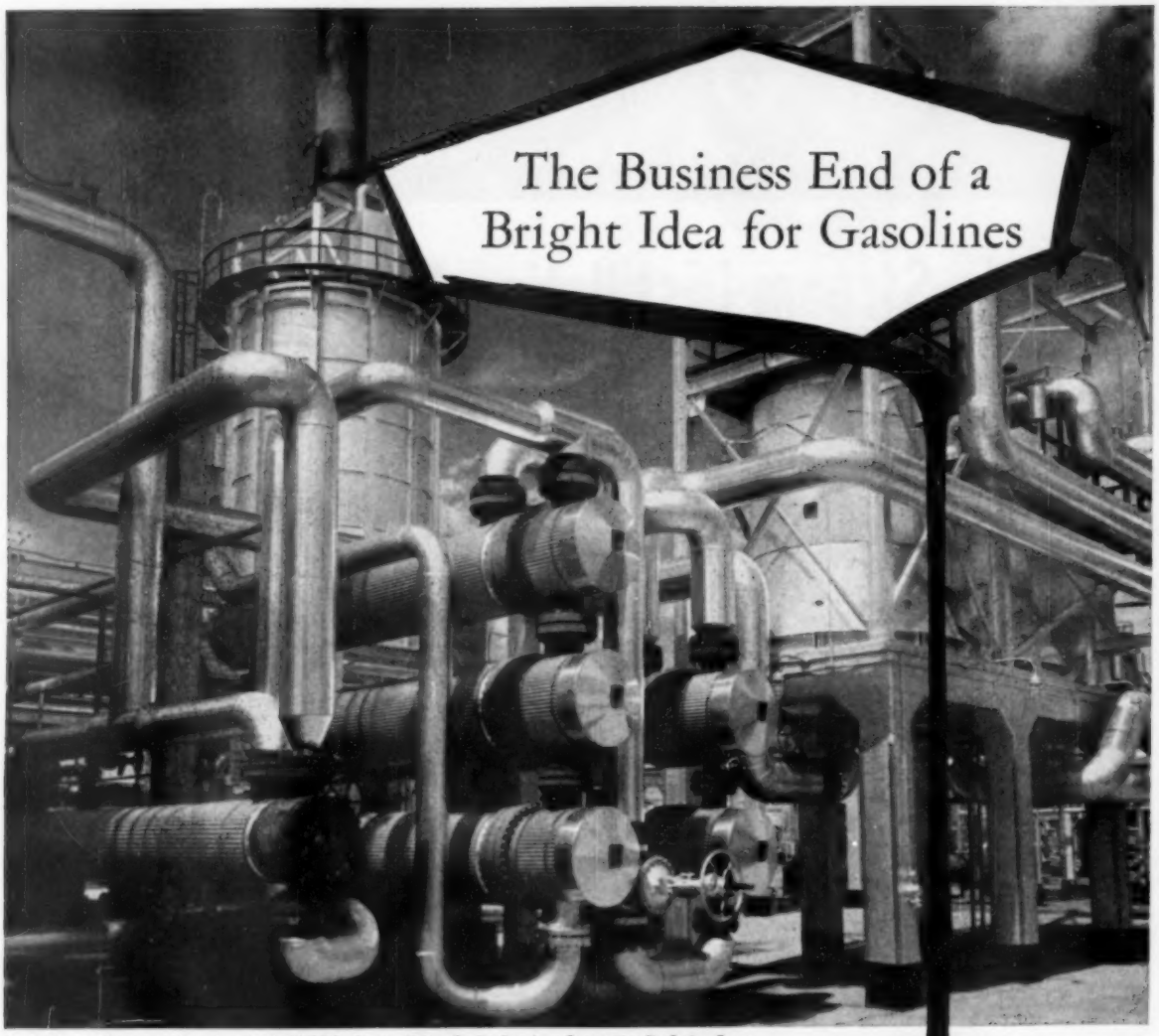
TECHNICAL SERVICE AVAILABLE

CARBIDE offers many technical services to the gas conditioning industry. If you have a gas treating problem, call the nearest CARBIDE technical representative or write Union Carbide Chemicals Company, Department B, 30 East 42nd Street, New York 17, New York.

"Union Carbide" is a registered trade-mark of Union Carbide Corporation

UNION CARBIDE
CHEMICALS
Union Carbide Chemicals Company
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N. Y.

The Business End of a Bright Idea for Gasolines



Heater, heat exchangers and reactors, heart of UOP Rexforming Unit at Cosden Petroleum Corporation, Big Spring, Texas.

This is the heart of the UOP Rexforming process, a new development in petroleum refining that produces automotive gasolines with the industry's highest octane ratings with remarkable efficiency and economy. The idea for Rexforming was born in Universal's research laboratories. UOP develops and designs the equipment required to make this process commercially practical. UOP field engineers follow every phase of construction and are right on hand to see that the actual plant functions smoothly from the very start. This is the full measure of Universal's service. From bright idea to smooth operation, it's a service that is available to all refiners everywhere.

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U. S. A.
Forty Years Of Leadership In Petroleum Refining Technology

UOP®

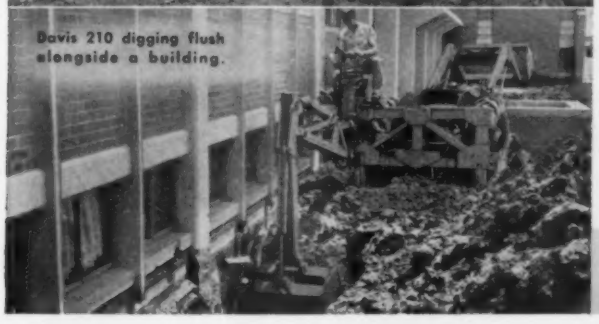
MAXIMUM VISIBILITY MEANS MORE PROFITS!

DISCOVER DAVIS

Davis Model 210 Backhoe and 102 Loader on a Model 202 Work-Bull Tractor.

YOU CAN SEE FOR YOURSELF

— it's the greatest LOADER-BACKHOE at any price... on any tractor*!



Davis 210 digging flush alongside a building.

Only the Davis Loader-Backhoe allows you unrestricted vision. You can see why this rig, with many such exclusive features gives you more earning power.

You sit high on the backhoe so you can see exactly where you're working and you move with the boom so you always face the bucket — just like on the big power shovels.

Only the Davis 210 Backhoe lets you dig flush alongside a building, wall, or fence. Vertical stabilizers, right-angle digging, and 10,000 pounds breakaway power give you the advantage on every job.

The Davis Loader — with built-in strength and streamlined design — has been widely copied, but never equalled.
You would naturally think that this rig would cost you more, but it actually costs less than most other makes.

*Davis Loaders and Backhoes are available for all popular models of International, Ford, Work-Bull, Ferguson Major, Ferguson, Case, Massey-Harris, Allis-Chalmers, Oliver, John Deere, and Minneapolis-Moline Tractors.

SOLD AND SERVICED EVERYWHERE BY BETTER DEALERS

For the name of your nearest dealer, call Western Union by number and ask for Operator 25 . . . or write direct. Please specify make of tractor.

MASSEY-HARRIS-FERGUSON, INC.
INDUSTRIAL DIVISION
1009 S. WEST ST. DEPT. OG WICHITA 15, KANSAS

"OUT IN THE OPEN"

Vogt

Steam Generators

for

CHEMICAL PLANTS

and

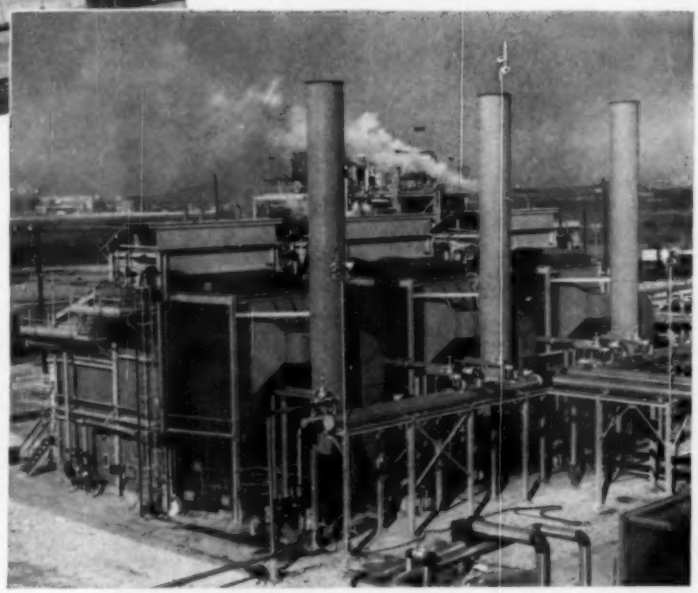
PETROLEUM REFINERIES

STEAM GENERATORS for economical outdoor operation have been featured by Vogt for many years and serve leading chemical plants and petroleum refineries. Requiring no building for housing, such installations, as pictured here, produce more steam per dollar of investment and are a definite aid to lower production costs.

Get Vogt's recommendations for steam generators to meet your needs for power, processing, or heating, without obligation. Package type and custom built units are available in a wide range of types, capacities, and pressures to meet operating requirements.

Write for bulletins. Dept. 24A-80

Three 85,000 #/hr. steam generators in a Texas refinery.



An outstanding chemical plant served by three 150,000 #/hr. units.

OTHER VOGT PRODUCTS

Drop Forged Steel Valves, Fittings and Flanges — Petroleum Refinery and Chemical Plant Equipment
Heat Exchangers
Ice Making and Refrigerating Equipment

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Pipe, buried for 25 years, is good as new

Applying NO-OX-ID "GG" over the cleaned surface

Next, No. 4 NO-OX-IDized wrapper for protection against abrasion

Finally, NO-OX-ID Filler Red "C," a seal coat, completes protection

THIS PIPE IS 25 YEARS YOUNG

Twenty-five years ago NO-OX-ID combinations sealed this pipe against corrosion. Today, after two and one-half decades of uninterrupted service, the pipe is as good as new.

HOW DO WE KNOW THIS?

Recently, new construction made relocation of the line necessary. Inspection revealed the original NO-OX-ID coatings and wrappers had chemically and mechanically stopped moisture penetration and corrosive attack. *Not a foot of pipe was replaced.* After cleaning and a new application of NO-OX-ID coating-wrapper combination, the pipe was lowered in. It's now ready for many more years of additional service.

Many leading pipeline companies and utilities rely on NO-OX-ID combinations for lasting pipeline protection. Consult your Dearborn representative next time you move pipe or lay new lines for the right combination to meet your soil conditions.

NO-OX-ID ADVANTAGES

Coats more feet per man-hours because less material is needed • Applied hot or cold • By hand, by Traveliner or at the mill • Requires less equipment • No noxious fumes.

USE THIS COUPON FOR MORE INFORMATION

Dearborn NO-OX-ID®

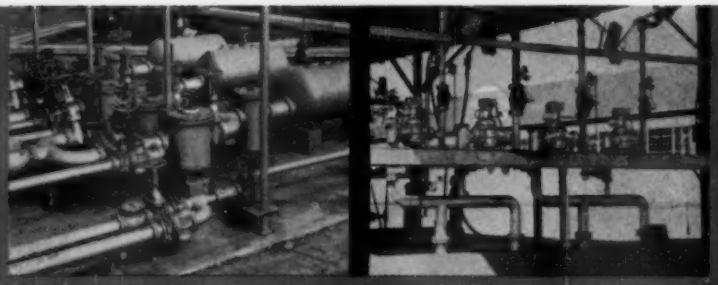
For Long-Term Protection Against Pipe Corrosion

Dearborn Chemical Company
Dept. OG-NO, Merchandise Mart Plaza
Chicago 54, Illinois

Gentlemen:

☐ Have a Dearborn Pipeline Representative call
☐ Send me NO-OX-ID literature

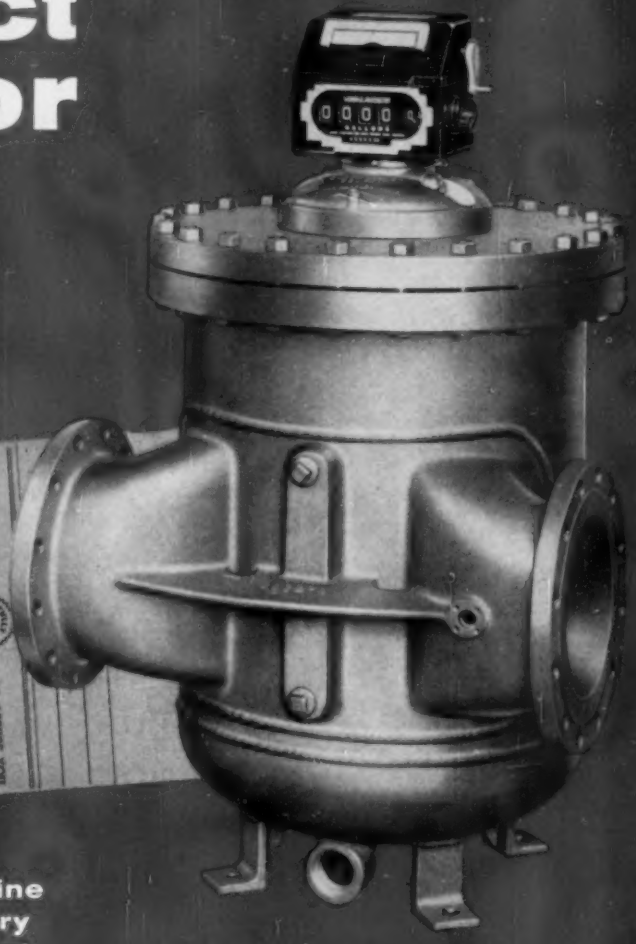
Name.....*Title*.....
Company.....
Address.....
City.....*Zone*....*State*.....



Typical installations of A. O. Smith Meters

Perfect Auditor

for any pipeline storage or transfer point



A. O. Smith positive displacement line meters account for every drop... *print* a permanent, tamper-proof record... simplify your bookkeeping

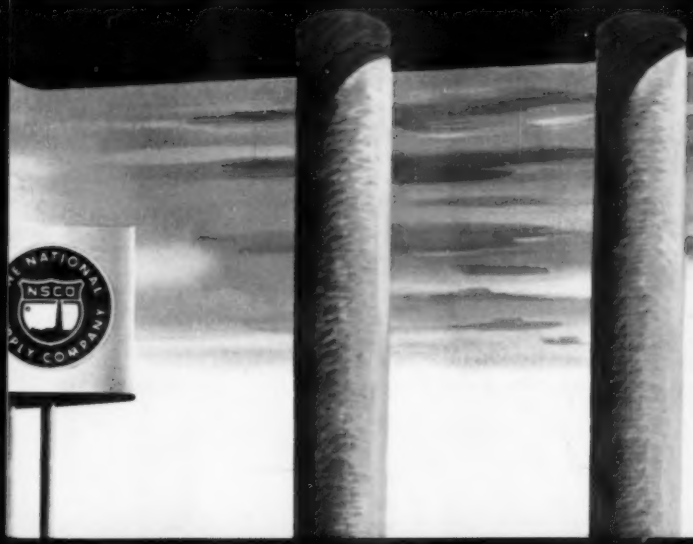
A. O. Smith developed the first rotary meter — proven over the years in accuracy and reliability. Now, we are expanding the scope of use of these meters by utilizing them as accounting machines. Let us tell you about it. Contact your nearest representative. Or write direct.

Through research ...a better way

A.O.Smith

METER, SERVICE STATION PUMP, DIVISIONS

Factories: 5715 Smithway St., Los Angeles 22, Calif.; P. O. Box 503, Succasunna, N. J. Offices: Atlanta 5, Ga.; Chicago 4, Ill.; Houston 2, Texas; Los Angeles 22, Calif.; New York 17, N. Y. Canada: Toronto 12, Vancouver 1; A. O. Smith International S. A., Milwaukee 1, Wisconsin, U. S. A.



How National's teletype network helps you

These were real situations:

• Customer reports extensive shaft damage on oil drilling rig in the Gulf of Mexico. Danger of $1,000,000 loss if shaft is not replaced immediately. Requires instant coordinated action by National Supply people in three states.

continued on next page

• Customer requires second hand oil drilling rig. Good chance for sale if one of our offices can locate the right model rig somewhere in the U. S. immediately.

• Fire at oil drilling site. Big machinery damaged. Spare parts must be obtained from warehouses in Texas and Louisiana and plant in California. Must have estimate of damage, repair costs and delivery date today.

National Supply was able to handle these emergencies in time. We were ready for them—just as we're ready for any emergencies you may have. This far-flung company is one of the country's largest users of teletype facilities. Equipment at 103 locations links all our plants with field and headquarter offices. In certain areas we have two-way radio between the headquarters, stores and our field men's automobiles.

It takes good communications to do business with the oil fields, where emergencies are big and demand fast action. They must be especially good when six plants, 129 stores, 68 branch offices and 700 field men are involved. Good communications have been essential in making National Supply the world's largest manufacturer and distributor of oil field machinery and supplies. Good communication—plus the most complete line of quality equipment available. Next time you're facing an emergency, one phone call to National can put all these benefits to work for you.

At Pittsburgh, heart of our 103-station teletype network, this punched tape speeds information to the oil fields.

Get trouble-free production with safe, flexible National hook-ups

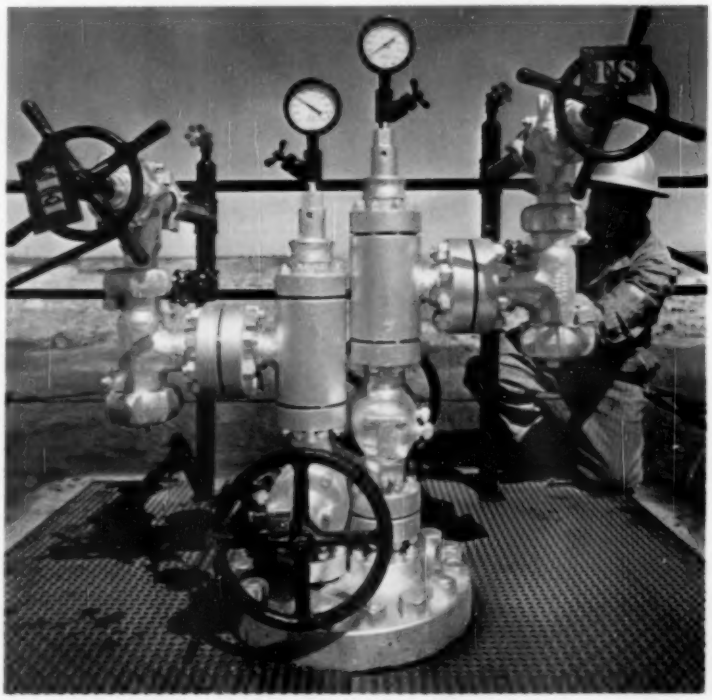
You can check a National Wellhead assembly from the bonnet to the casing flange, and find all the features you need for safe, sure operation. Look at these outstanding features of National Wellhead Equipment—

Ease of assembly—parts are self-locating and self-activating, no special tools are needed for installation.

Maximum flexibility—interchangeable units afford a multitude of combinations to meet your specific needs in size, capacity and type.

Pre-tested safety—National's triple-sealed Pressure Pack design insures trouble-free performance and longer service life. Intensive testing procedures include special methods more severe than those specified by API standards.

You find National Wellhead Equipment readily available through all National Supply Stores—as well as complete advisory service on wellhead application problems. A complete line in every store's stock includes a wide variety of tubing hangers, bonnets, flanged and screwed fittings, valves, flow beans and specialty items to meet your every need. It will pay you to use this quality wellhead equipment and the helpful service that comes with it.



Dual-completion wellhead assemblies like this National installation are very economical under the proper conditions. This operates two strings of tubing, and has two master valves to allow maintenance on one without stopping production on the other.

THE **NATIONAL SUPPLY** COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

More quality production equipment on the next page...

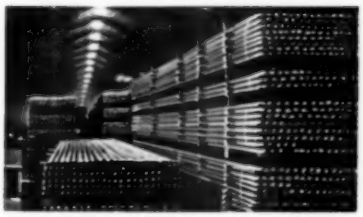
Get low cost reliable pumping with National units

Having trouble with load reversals? National Pumping Units have an extra margin of strength that meets this problem. They have exceptionally hard alloy steel gears and pinions designed for long wearing life. Gear train mounting and main bearings offer lower shaft loading and deflection . . . easily handle shock loads from load reversals.

There are other important National Pumping Unit features that insure dependable operation:

- Easy-to-install, strong main base.
- Exceptionally stable, well balanced samson post.
- Pitman assembly features easy maintenance, fast assembly.
- Rugged walking beam and beam hanger for extra years of service.

Get the facts on National Pumpers today. For the full story on the high performance and low operating costs they offer, see the National Supply Store men or representatives in your area soon. New bulletins giving the complete story on these quality pumping units are available.



Get reliable service, too, from precision-made National Sucker Rods. They have top resistance to fatigue, shock, corrosion and impulse loads. Available in a range of grades for every condition.

For certain types of wells, the National Plunger Lift can be the best production method. It uses either formation gas or injected gas for operation. See your National representative for details.

Remember National Triplex Pumps for waterflooding and a host of other oil field pumping jobs. They're available in several h.p. ratings for both corrosion and non-corrosive service.

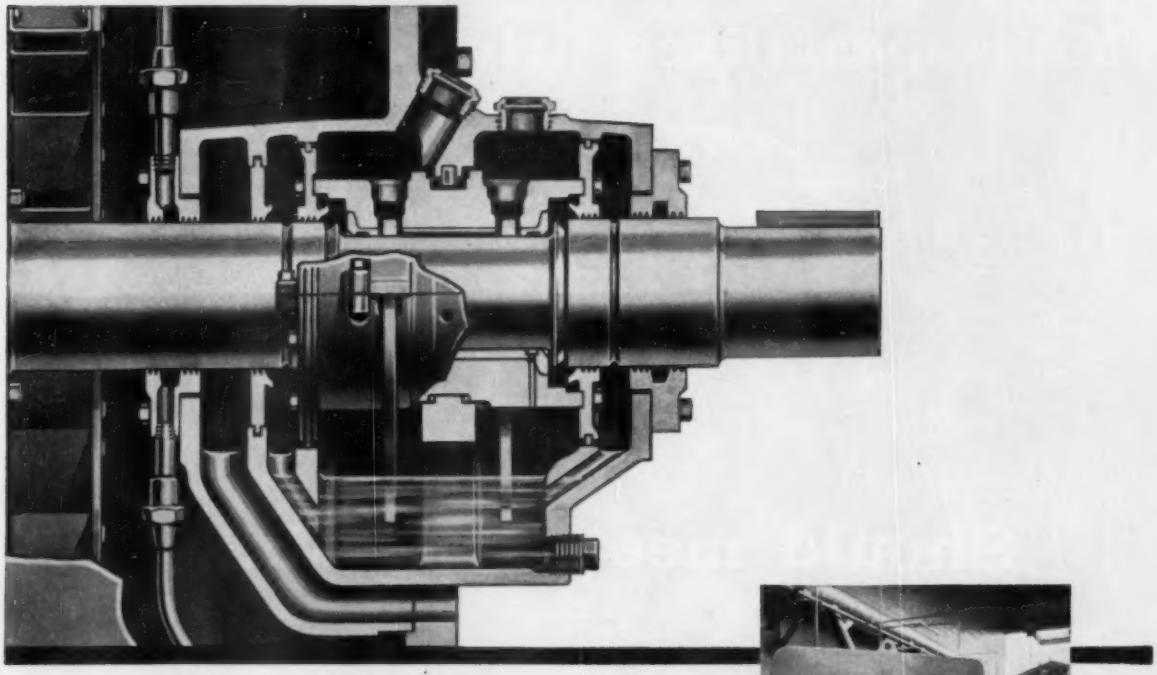
THE NATIONAL SUPPLY COMPANY

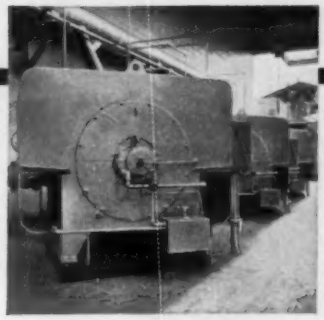
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

One of many reasons why **ALLIS-CHALMERS MOTORS** operate dependably in the

PETROLEUM INDUSTRY





Pump drives for oil well flooding service.

Motor Bearing is "extra sealed" with vent

A VENT is seldom a seal . . . but it is in this high speed Allis-Chalmers motor.

Just in case any oil or oil vapor might pass out of the bearing enclosure through the regular seals it can never reach the motor interior. Instead, it enters an annular chamber at the rear of the bearing housing. Pressurized air from the motor fan region is introduced into this pressure chamber and is vented to atmosphere. Positive protection is provided.

Accessible, Too!

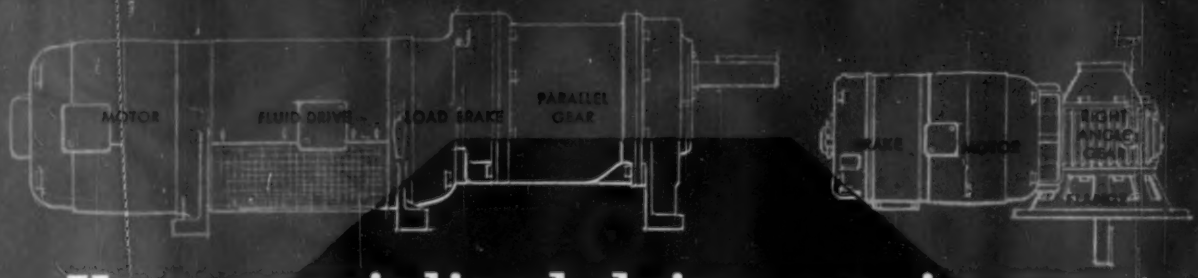
Many man-hours in maintenance are saved because the motor can be inspected and maintained without opening or disturbing the bearing itself. It is only necessary to remove the upper half of the split end shield.

For details on these and other features of Allis-Chalmers motors, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

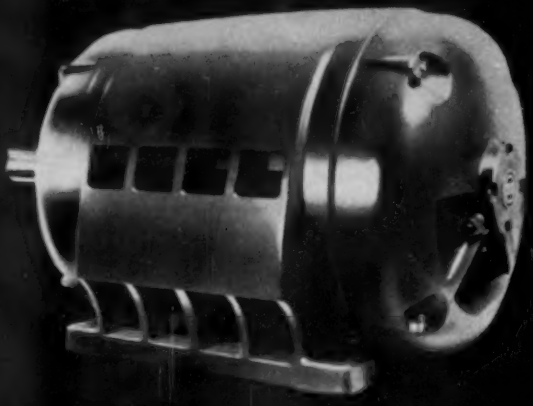
A-C ALLIS-CHALMERS

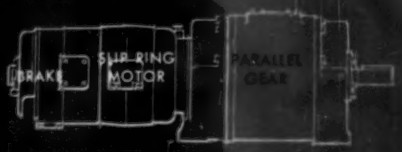
ALLIS-CHALMERS

A-5476

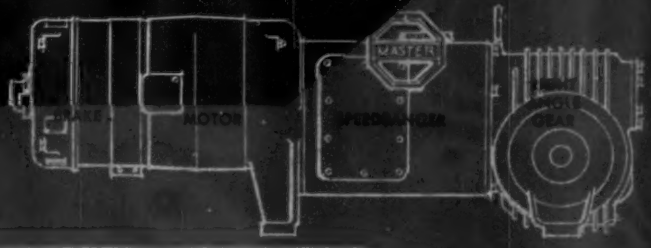


Your specialized drive requirements





Should meet their Master



Master Units Combine into Engineered, Customized Package Drives—Providing the Right Shaft Speed, the Right Construction Features, the Right Mounting. Why Put Up With Makeshift Assemblies?

Engineers and Manufacturers of

Electric Motors	**⅛ to 400 H.P.**
Gearmotors	**⅛ to 125 H.P.**
Variable Speed Drives	**⅛ to 30 H.P.**
Unibrake Motors	**⅛ to 150 H.P.**
Fluid Drive Motors	**½ to 15 H.P.**

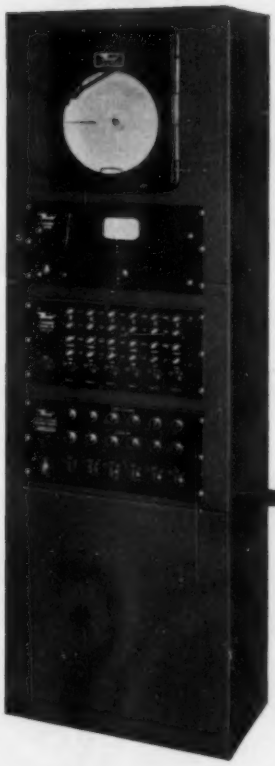
Alternating current motors, direct current motors, generators . . . open, enclosed, explosion proof . . . with 5 types of gear reducers . . . with electric brakes . . . with mechanical or electronic variable speed units . . . with fluid drives . . . Master has them all and so can be completely impartial in helping to select the one best drive for you.

MASTER ELECTRIC MOTORS

THE MASTER ELECTRIC COMPANY, Dayton 1, Ohio

★ Viscosity
★ Specific Gravity

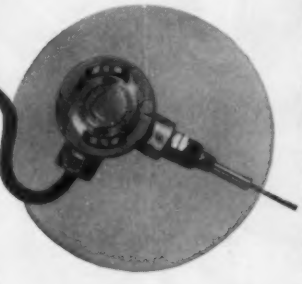
A BETTER WAY TO CONTROL EACH, AUTOMATICALLY AND CONTINUOUSLY

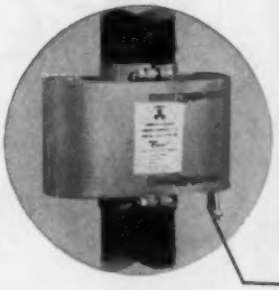


BENDIX ULTRA-VISCOSON*

Provides continuous and automatic viscosity control of from one to six individual stations in a single system. Ranges: 0-50,000 centipoises X grams /cc. Proven uses in liquid blending, fuel atomization or refinery applications in the petroleum, chemical, steel, gravure and flexographic printing, resin, adhesives, paint finishing and various other fields. Ultra-Viscoson systems are available to fill most industrial and research requirements.

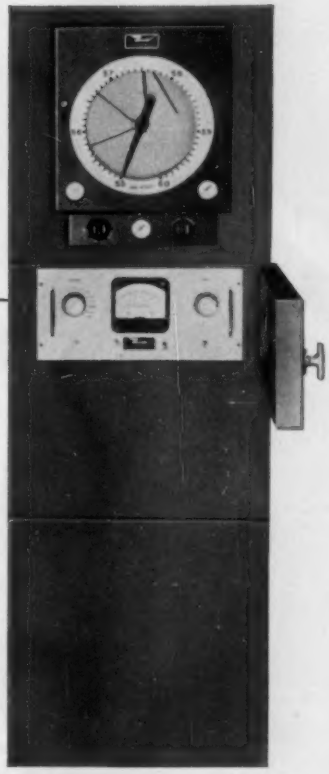
*REG. U. S. PAT. OFF.





BENDIX NUCLEAR DENSITY GAGE

Provides continuous and automatic control of fluid density in process pipelines. Range: 0.5 Sp. Gr. and up, with adjustable spans. Ideal for use with abrasive, corrosive, viscous and high-pressure processes; sensing element does not contact process material. Applications: Density, specific gravity, liquid concentration, vapor/liquid ratio, liquid level, slurry control and interface detection. Range, span and time constant adjustments from front panel.



For complete information write
Cincinnati Division, Dept. 350, 3130 Wasson Road, Cincinnati 8, Ohio.

Cincinnati Division

Export Sales: Bendix International Div., 205 E. 42nd St., New York 17, N. Y. Canada: Computing Devices of Canada, Ltd., Box 508, Ottawa 4, Ontario

Bendix
AVIATION CORPORATION

UNDECIDED

WHETHER TO BUY OR BUILD A GAS ANCHOR?

THE oilmaster MARSH GAS ANCHOR

. . . absolutely cannot be fabricated in the field out of old pieces of tubing, line pipe, and an assortment of collars and bull plugs. It also costs more than a field fabricated "Poor Man's" anchor.

However, we sincerely believe that within the design limits of the outside diameter of an upset tubing collar, the Marsh Gas Anchor is the finest oil-gas separator that can be run into an oil well. We are the first to admit that it costs more money to offset the up-pass tube than it would to run a "stinger" down the center, but well results confirm laboratory tests that this larger unbroken separating area effectively increases the slip velocity of the bubbles by substantially reducing the hydraulic radius.

There are many benefits from improved down-well gas separation. Frequently a smaller bore pump can be run. In some instances this eliminates the need of tapered rod strings, and permits running a smaller size unit. Gas lock is less frequent, and gas pound is reduced or eliminated.

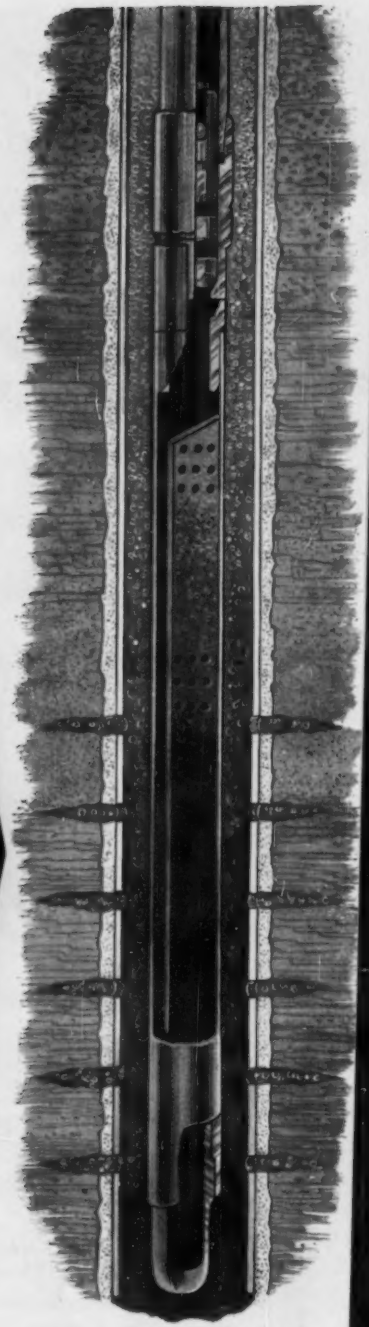
If gas separation is a problem, next time you pull tubing in a gassy well or on your next well completion, ask your Oilmaster Representative to bring out a Marsh Gas Anchor and try it yourself. Write Fluid Packed Pump Co., Box 64, Los Nietos, California, for literature.

oilmaster PUMPS FOREMOST IN THE INDUSTRY

FLUID PACKED PUMP CO.

Main Office and Plant, Los Nietos, California

Distributed by the National Supply Co., Pittsburgh, Pa.
Export: The National Supply Co., Export Division,
600 Fifth Avenue, New York
Co-Distributors: Union Supply Company,
Beacon Supply Co., Industrial Supply Co.



Schematic illustration of the Marsh Gas Anchor in operation. The anchor is set opposite the perforations. Gas is breaking out of the oil and some is rising directly up the casing. Gas and oil are being drawn into the anchor principally through the lower set of perforations. The large, unobstructed down pass chamber permits the bubbles to rise and escape out of the upper perforations, while relatively gas-free fluid is drawn into the up pass tube for suction to the pump.

Waldron couplings on processing pumps in a natural gasoline plant.

by specifying

WALDRON

Gear Couplings

you get

STRENGTH — Hubs and cover sleeves for sizes 1¼A through 7A are machined from tough steel forgings. Hubs are keyed to the shafts. The two one-piece cover sleeves function as a single, rigid unit serving as a floating connecting link between the hubs. High strength of forgings makes possible a very compact coupling with low rotating inertia.

RELIABILITY — There are no flexible parts to bend or break and the coupling is dust, moisture, and oil tight. Patented Walflex seal is positioned where centrifugal force is least. Clearance between teeth in hubs and sleeve is engineered so that an oil wedge always separates them, taking the wear.

SERVICE — Plenty of rough bore couplings, already assembled—on the shelf for *immediate* delivery. Finish bored standard couplings shipped to meet customers' schedules. We are geared up to give you realistic delivery on *any* type of couplings.

▸ Ask for Catalog 57

JOHN **WALDRON** CORP.

NEW BRUNSWICK, NEW JERSEY

Representatives In Principal Cities

They Say—

Journal in the classroom

Dear Sir:

We wish to thank you for the copies of the Journal's "Better Management" series that you so graciously supplied us with. These are of great help to our instructors here and also the students.

Each week we are putting a new 10-minute Journal feature on the bulletin board for all of the students of the School of Business . . . I am also using the Journal in regular classroom discussions.

Again we thank you for the wonderful help of the Journal to the students and instructors of this college.

Prof. Walter R. Edwards
Department of Business and Economics
Arkansas State College
State College, Ark.

Editor's note: A few copies of the following installments of the Journal's "Better Management" series are still available. Free copies may be obtained by addressing The Oil and Gas Journal, Reader Service Dept., P.O. Box 1260, Tulsa 1.

Article—	Issue	Page
Tips on Trainee Instruction	1-21-57	121
Tips on Training—1	2-25-57	151
Tips on Training—2	3-18-57	159
The Functions of Leadership—1	4-15-57	145
The Functions of Leadership—2	5-13-57	157
Some Tips on Planning	6-10-57	129
Tips on Decision Making	7-15-57	125
Mansurance . . . A New Management Tool	8-12-57	133
Tips on Memo and Report Writing	9- 9-57	129

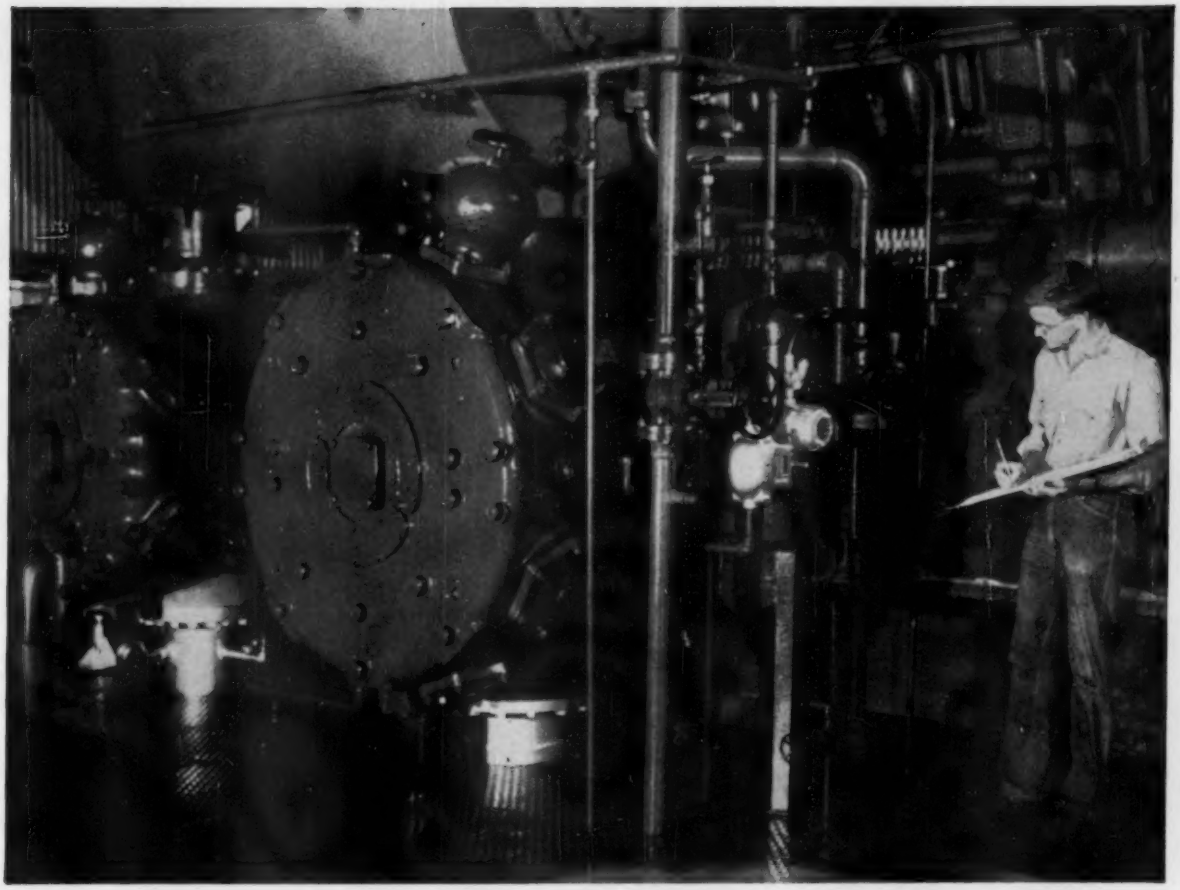
Journal reader for 42 years

Dear Sir:

I think I can remember subscribing to your magazine in the first part of 1915 and I have been wondering if I have an unbroken record from that time to date. Would it be too much trouble to look back over your records to see?

If there have been times that I did not take your magazine they were when I was working in places where mail was hard to come by such as Drumright, Ranger, and other places. I have been in the oil fields all my life and still think it a wonderful business, still look forward to each day's work as I did 50 years ago.

As the older workmen did, when I left my native West Virginia home,



Ease your mind about air compressor fires... with fire-resistant PYDRAUL® AC lubricant

Forget the anxiety of possible fires and explosions in your air compressors!

Successful field experience throughout industry proves that fire-resistant Pydraul AC protects against these hazards, gives excellent lubricity and can minimize carbon deposits on air compressor exhaust valves and air piping systems... where your fire danger really lurks.

From the largest reciprocating air compressor to the smallest portable... fire is a persistent worry, unless you use fire-resistant Pydraul AC to protect your investment.

Conversion is easy... essentially, just drain your flammable oil and replace with fire-resistant Pydraul AC.

Write today for Monsanto's new bulletin covering details on use of Pydraul AC.

There's also a Pydraul for every industrial job:

- General-purpose Pydraul F-9.
- Pydraul 150 and Pydraul 60 for precision equipment.
- Pydraul 600 for heavy equipment.

Pydraul: Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division, Dept. PAC-78, 800 N. 12th Blvd., St. Louis 1, Missouri
In Canada: Monsanto Canada Ltd., Montreal

MONSANTO

WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

The Simplest Gas Lift Valve on the Market

ONLY TWO MOVING PARTS

NEW OTIS TYPE F RETRIEVABLE GAS LIFT VALVE

This is a completely new, different gas lift valve . . . a tool gas lift men have been wanting to run for years. It has only two moving parts . . . no metal moving parts. There are no valve seats to cut out . . . no metal bellows to fatigue. The same valve can be used for either continuous or intermittent lift, just by making a simple change at the wellhead; no need to buy another string of valves to convert a system — a simple solution to borderline wells (one-third of the gas lift wells on the Gulf Coast).

The new Otis retrievable valve has a much greater dome area than any other pressure-operated valve. This permits a softer acting valve that is fully open with a 10- or 15-pound build-up above the set pressure. The Type F is a completely balanced valve with respect to the opening and closing at the same pressure. It has no uncontrolled spread, which means that the operator has complete control of the gas that is injected at the surface, on either continuous or intermittent lift. The Type F is run with a standard kick-over tool and lands in a standard side-pocket gas lift mandrel.

All in all, you will find this new valve to be the most efficient, flexible gas lift valve on the market, with many operating features not available in any other equipment. Your nearest Otis office will be glad to give you additional details and illustrated literature without obligation.

OTIS ENGINEERING CORPORATION

Branches Throughout the Oil Country

PRESSURE CONTROL - OTIS - SERVICE - EQUIPMENT

I roamed from one oil field to another—Illinois, California, Kansas, Mexico, Oklahoma, Ohio, and others.

O. G. Lawson
Cisco, Tex.

(Editor's note: Because of lack of storage space, the Journal's individual circulation records go back only 3 years. However, our circulation department estimates that Lawson is one of our oldest subscribers).

Where Venezuela's oil goes

"Including exports from the refineries in Aruba and Curacao, which process Venezuelan crude, about half of Venezuela's output goes to the United States and Canada, 20 per cent to Central and South America, and the rest to Europe and other parts of the world.

"As might be expected, Shell differs from the general pattern to some extent, and a rather larger proportion of Shell's offtake is sold in the Eastern Hemisphere, Europe alone taking over a third of the total. Venezuelan crudes in general, and Shell's in particular, comprise a relatively high proportion of the heavier grades and the distribution of exports is therefore in part determined by the demand for residual fuel in various areas. About a third of Venezuela's oil and over 40 per cent of Shell's production is shipped in the form of residual fuel."

G. C. K. Dunsterville, president, Cia. Shell de Venezuela, Ltd., in a speech to the Tulsa Nomads.

Canada debates gas exports

"Everyone will agree that Canadian needs (for natural gas) must first be met before export can be considered. But Canada's requirements are already assured, and, therefore, we can supply large quantities for export. The time to begin export programs is right now!

"Let us recognize realistically the implications of anything less than a proper export program; let us recognize clearly the dangers of postponement. In my judgment, without export markets, Canada's natural-gas industry will never mature. We need export markets for natural resources, such as pulp and iron ore, and for manufactured products, too—in fact, for everything that is surplus to Canada's domestic needs. Natural gas is no different from anything else. And

Stop that tubing job....

...here comes a

VoluMAX!

If you need an increase in volume to meet your allowable, DON'T replace the tubing. Instead, call J&L Supply.

An Axelson VoluMAX pump will get you from 10% to 27% more barrels per day without increasing your cycle rate.

Or, if your production is ample but your cycle rate is too high, reduce the cycle rate by installing an Axelson VoluMAX pump.

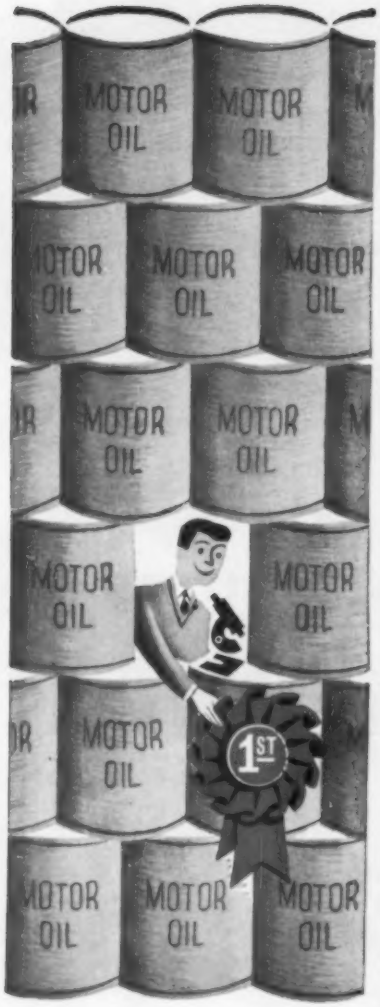
Make tubing jobs obsolete where increased volumes are required by replacing conventional pumps with Axelson VoluMAX.

To find out what increase you could reasonably expect from this two-in-one pump, or for literature that will give you technical details, call J&L Supply now.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES



You can make the finest lubricants when you

BLEND WITH ENJAY PARAMINS®*

*the *only* complete line of high-quality additives for fuels and lubricants.

ENJAY

Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 W. 51st ST. NEW YORK 19, N. Y.

Akron, Boston, Chicago, Detroit, Los Angeles, New Orleans, Tulsa

bear this in mind: Much of this energy discovered in the future will remain dormant until it no longer serves a useful purpose.

"In addition to the fact of energy lying idle is the effect that the lack of export will have on exploration programs now under way in western Canada. Unless adequate export markets are forthcoming without delay, it will be necessary for many companies to cut back their operations severely until a more economic atmosphere exists."

E. D. Loughney, senior vice president, British American Oil Co., Ltd., in a speech to a Toronto Rotary Club.

Oil "selling" can backfire

"Some of the oil and gas men spend too much time trying to 'sell' a member of Congress on the depletion allowance, upon the free wellhead pricing program, and upon opening up federal lands for exploration which are regarded jealously by the people as their national parks and monuments.

"In one campaign in which I played a part, I think there was some $200,000 spent by petroleum interests in behalf of one, maybe more, candidates. The investment failed because the candidate failed. That $200,000 would have produced more benefits for the New Mexico oil and gas industry if we had spent it on the consumer to show him what the real picture in petroleum is today."

U. S. Sen. Dennis Chavez, New Mexico, in a speech to the New Mexico Oil and Gas Association.

CALENDAR

JANUARY

6-13 Short course on oil and gas law, sponsored by Southwestern Legal Foundation and Southern Methodist University School of Law, Southwestern Legal Center, Dallas.

11-12 National Oil Scouts and Landmen's Association, directors' meeting, Adolphus Hotel, Dallas.

16-18 Association of Oilwell Servicing Contractors, second annual convention, Baker Hotel, Dallas.

19-22 Pipe Line Contractors Association, tenth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

20-21 Compressed Gas Association, Inc., forty-fifth annual meeting, Waldorf-Astoria, New York.

29-31 Ninth annual Institute on the Law of Oil and Gas Taxation, sponsored by Southwestern Legal Center, Dallas.

31 Natural Gasoline Association of America, regional meeting, Skirvin Hotel, Oklahoma City.

FEBRUARY

3-4 Instrument Society of America, chemical and petroleum industry symposium on progress and trends in chemical and petroleum instrumentation, Hotel Du Pont, Wilmington, Del.

12-14 National Association of Corrosion Engineers, Tulsa section, ninth annual corrosion short course for pipeliners, Mayo Hotel, Tulsa.

13-15 National Society of Professional Engineers, spring meeting, Michigan State University, East Lansing, Mich.

16-20 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Hotel Statler, New York.

26-28 American Petroleum Institute, Division of Production, southern district meeting, Shamrock-Hilton Hotel, Houston.

28 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

3-4 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.

5-6 Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.

7 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

10-13 American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists, forty-third annual meeting, Biltmore Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.

17-21 International Atomic Exposition, Inc., 1958 Nuclear Congress, Chicago Amphitheatre, Chicago.

17-21 National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.

20-21 New England Gas Association, annual meeting Hotel Statler, Boston.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

31-April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

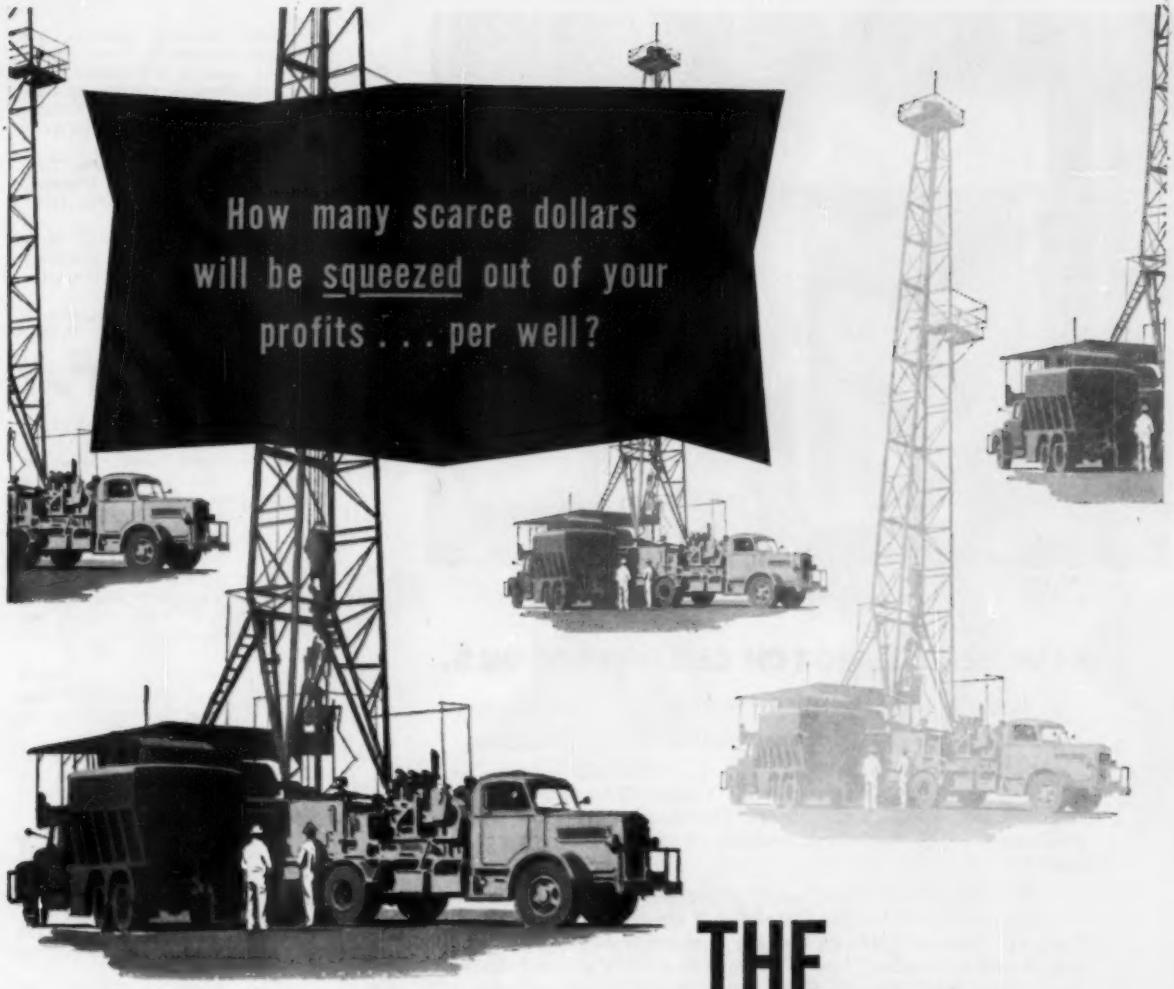
13-18 American Chemical Society, national meeting, San Francisco.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.

16-18 National Petroleum Association, fifty-fifth semiannual meeting, Hotel Cleveland, Cleveland.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and



THE WEATHERFORD TECHNIQUE

Can Actually SAVE Dollars For You

The Weatherford Technique will give you a successful primary cement job—one that is free from the threat of remedial squeezing.

This fact is of great importance to today's operators—faced as they are with increasing costs and shrinking profits. Squeeze jobs, of course, are paid for out of profits. The costs, including loss of time and production, can never be recovered.

The Weatherford Technique eliminates the need for squeezing by assuring a successful cement job the first time. This Technique is being used successfully in hundreds of wells each month.

Well reports and case histories are retained at every field location. Your Weatherford representative will gladly make these available to you.

Talk to your nearest Weatherford representative, or write for literature.

WEATHERFORD
OIL TOOL CO., INC.

GENERAL OFFICES: 5920 Navigation Blvd., Houston, Texas

W&T V-notch Chlorinator installed at Esso's Baton Rouge Refinery feeds chlorine at rates up to 500 lbs./24 hr. Units are available with chlorine capacities up to 2000 lbs./24 hr.

NEW W&T V-NOTCH CHLORINATORS,

used at Oil Refineries, are rugged, easy to operate and moderately priced.

Esso Standard Oil Co. has a W&T V-notch Chlorinator installed at their Baton Rouge, La., Refinery. The chlorinator, installed in a small shed open to the sun and weather, chlorinates cooling water for slime control.

This type of installation would be considered rugged service for other equipment but V-notch Chlorinators are designed for such use. They are made of materials that are completely resistant to corrosion as well as weather. They are simple to operate and to maintain. In addition, W&T V-notch Chlorinators are an attractive piece of equipment, colored green to fit into industrial color schemes.

For more information about W&T V-notch Chlorinators, send for bulletin CD-44.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

PRECISE PRESSURE MEASUREMENT

. . . For Low Pressure Work

Ranges: 0—10 inches water (min.) to 0—30 inches mercury (max.). Intermediate ranges available.
Accuracy: 1/300 of full scale
Sensitivity: 1/500 in *all* ranges
Dial Size: 2¾" or 6" diameter

TYPE FA-141

Write for Publication No. TP-27-A

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, N. J.

Mississippi petroleum sections, gas technology symposium, Shreveport, La.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

23-25 Second International Williston Basin Symposium, sponsored by Saskatchewan Geological Society and North Dakota Geological Society, Regina.

27-29 Independent Petroleum Association of America, midyear meeting, Hotel Sherman, Chicago.

27-30 American Association of Petroleum Geologists, Rocky Mountain section, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-30 Southern Gas Association, annual convention, Dallas.

MAY

5-6 Society of Petroleum Engineers of A.I.M.E., North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Division of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

8-9 Texas Petroleum Research Committee, eleventh oil recovery conference, symposium on "A Century of Texas Oil, 1875-1975," University of Texas, Austin.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-14 Instrument Society of America, symposium of analysis instrumentation division, Shamrock Hilton Hotel, Houston.

12-16 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

JUNE

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

19 Pennsylvania Grade Crude Oil Association, annual meeting, Penhills Club, Bradford, Pa.

23-25 Interstate Oil Compact Commission, midyear meeting, Hotel Utah, Salt Lake City.

O-C-T CASING HEADS ARE BUILT FOR EVERY COMPLETION CONDITION

and their economy is a guarantee . . . not a possibility

The "C-19," "C-19C," and "C-20" Casing Heads offer flexibility, because they meet every well completion condition . . . they offer economy because of safety and rig-time saving.

The "C-19" and "C-19C" offer economy because load capacity is twice as great as conventional slip hangers, because

- Openhole Hazards are eliminated
- Slips bite evenly
- Removal of blowout preventers before casing is suspended is eliminated

The "C-19" and "C-19C" save rig time because

- Installation is simple and thus rapid
- Sealing element, slip bowl, slips assembled as a single unit
- Seal is automatic
- No field welding is required

The "C-20" for medium depth wells is quick-setting, positive sealing. Same advantage of the heavier C-19 series is offered.

The Oil Center Tool Company stays abreast of oilfield problems.

Type C-19 Hanger in open position

Type C-20 Hanger in open position

O·C·T

OIL CENTER TOOL CO.

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

That's almost certain to be the plight of companies who don't plan for their tank car requirements in the decade ahead. It's no secret that available general-purpose tank cars are going to be limited. With normal obsolescence of today's facilities, the continuing steel shortage, and with forecasts pointing to a more than 50% expansion in our economy, *liquid product shipments may be difficult . . . may miss tomorrow's sales opportunities.*

P. S. Plan now to discuss your long-range needs with our GATX District Man. You'll find . . . it pays to plan with General American.

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street • Chicago 90, Illinois

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY . . . Mid-Continent Manager
ROY E. FINLEY . . . . . Representative
D. B. MILLER . . . . . Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
E. S. KLAPPENBACH . . . . . Eastern Manager
HARRY B. BULLEN . . . . . Representative

PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets,
Rittenhouse 6-0118
JOHN W. MEANY, JR. . . . . District Manager

CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY . . . . . District Manager
KAREL WEGKAMP . . . . . District Manager

DETROIT
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455
JOHN D. YODER . . . . . District Manager

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES . . . . . Manager

HOUSTON
802 Sterling Building, CApitol 4-7726
JOHN M. SPEARS . . . . . Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building
Riverside 8-3074
PREN G. HOLLINGSWORTH . . Representative

LOS ANGELES
650 South Grand Avenue, VAndike 0722
GEORGE O. RUPPERT . . . . . District Manager

ENGLAND
National Provincial Bank Chambers
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER . . . . European Representative

•

Subscription rates to the petroleum industry, United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies; regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1957 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING

The Uniquack Guide

NOT LONG AGO the New York Times carried a glossary of the new terms which have been added to the Washington vocabulary since the Russians sent up that first Spu'nik. It said the definitions were provided by the Society for the Exposure of Political Nonsense with the aid of its remarkable new invention, Uniquack, an electronic truth detector.

Here are a few sample definitions, according to the Times:

Crash program: A method of scientific discovery or military production that costs twice as much as it should because it is 3 years late.

Orbiting: Going round and round in outer space or circling a problem cautiously in the Pentagon.

Air Force: An organization of valiant humans who flew in machines for a brief period between 1917 and 1957 before the invention of rockets and missiles. Obsolete.

Nuclear scientist: A man who never met a payroll and has funny ideas.

Activate: A method of dusting off and putting into practice essential programs vetoed by the Budget Bureau in 1954.

Nose cone: A television prop calculated to assure that if you keep your nose close to this cone you will not know what is going on behind it.

Adequate implementation: A bit of gobbledegook meaning "we'll try."

Executive - legislative cooperation: An executive phrase meaning "if we get through this next session of Congress alive, we'll be lucky."

Mobilize the brains of the country: A belated tribute by the fatheads to the eggheads before an election.

Well, this glossary proved so helpful in understanding the news reports coming out of Washington that we thought we should provide our readers with a similar glossary of words and phrases quite commonly used in the oil industry these days.

So at great expense we employed the services of this remarkable Uniquack to grind out simple definitions of expressions that all oil men use but which sometimes seem to be misunderstood.

Here are the results:

Demand forecast: What somebody else is always exceeding, thereby causing disastrous oversupply which could have been prevented if he had only believed the figures.

Foreign oil: What keeps domestic producers from earning enough money to go after some of it themselves.

Supplement but not supplant: A volume of imports low enough to antagonize friendly nations and disrupt the plans of foreign operators, but high enough to be the cause of all problems of the industry.

Voluntary controls: You had better do voluntarily what the Government says it is going to make you do, or else—the "or else" never being specified.

Conservation: The theory that future generations will have plenty of oil if today's oil producers are permitted to accumulate enough money so that their grandchildren can afford to drill more wells.

Proration: A system of equitable allocation of production among wells so that instead of anybody going broke fast everybody goes broke slowly.

Monopoly: Anybody in the industry bigger than you and who can be blamed for preventing you from making as much money as you would like.

Independents: Sterling characters opposed to monopoly, the only people who know how to find oil, the backbone of the industry, the hope and salvation of the nation.

Pipeline: An underground facility operated for the purpose of preventing the transportation of crude oil from remote areas.

Natural gas: A waste product of oil wells which costs nothing to produce but for which oil-rich producers charge exorbitant prices to shivering easterners.

Public relations: Why doesn't somebody stop the newspapers from printing unkind things about oil men?

—*Henry D. Ralph.*

Here's the most modern hook-wall packer yet!

Product No. 420-E

The NEW BAKER Model "E" RETRIEVABLE CASING PACKER

Drawing on the experience and know-how gained from 30 years of leadership in the field of design and development of high-performance retrievable squeeze tools, BAKER has combined many of the features from these tools with the simplicity of J-Slot operation to make possible this short, most modern of all hook-wall packers.

Only three feet long, the Model "E" Retrievable Casing Packer has the same rocker-type slips and proven dependable packing element used so successfully on BAKER retrievable squeeze tools. No drag springs to make a long, cumbersome tool. No slip tie-links or guide grooves to allow the slips to become stuck or cocked. No restricted bore to prevent running instruments through the packer.

Easy to run (just rotate to the right and set down) and easy to retrieve (just pick up the tubing) the BAKER Model "E" Retrievable Casing Packer is a model of high-performance in a small package.

See your BAKER man today for additional information on how the BAKER Model "E" Retrievable Casing Packer can solve your hook-wall packer needs.

BAKER

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

Coal and gas views can't be compromised

IT is being whispered around that easy passage of the Harris bill could be assured if the natural-gas industry would only compromise with the coal industry.

The coal industry threatens to block passage of the bill unless it gets what it wants. It wants the Natural Gas Act amended to prohibit industrial sales of gas below an arbitrary definition of cost.

Industrial use of gas is completely extraneous to the subject matter of the Harris bill, which is to clarify a Supreme Court decision dealing with gas producers' prices. Control of industrial use would open a whole new field of federal regulation.

COAL IS A DOG IN THE MANGER. It doesn't care about the producer provisions but it won't let gas producers have what they need unless coal gets something it wants. It is asking for logrolling, not compromise.

But consider the coal proposal on its merits. The only possible conclusion is that it would be disastrous to gas producers, pipelines, distributors, and consumers.

The present law says, in effect, that producers can't sell gas above cost. The purpose of the Harris bill is to get away from this cost formula. Now coal wants to say that gas can't be sold below cost. This would put the cost formula right back in the law—in reverse. Compromise of such philosophies is impossible.

The objective is to raise the price of gas in areas where it competes with coal. If it weren't, coal wouldn't be interested. The effect would be to price gas out of many of its present markets.

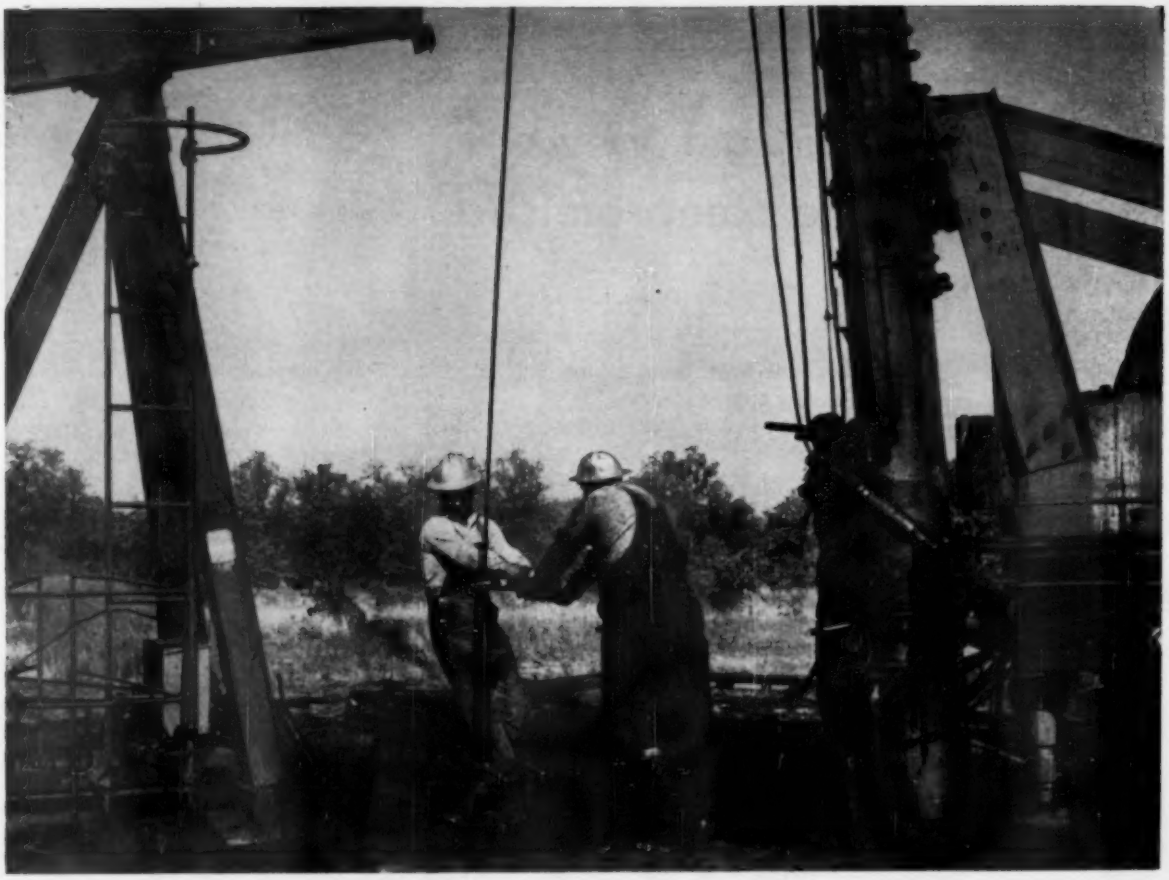
Industrial sales are essential to a new pipeline to build sufficient initial volume to justify financing. Interruptible industrial sales are essential to established pipelines to permit near-capacity operation during the off-peak summer period.

Without industrial markets, many lines would be nearly idle in the summer. The cost of idle capacity would have to be charged against winter sales to residential and commercial customers. This cost squeeze would force consumer prices up and producer prices down.

Pipelines could buy little gas in the summer. They would have to abandon minimum "take or pay" contracts with producers. A producer making a direct sale to an industry (as distinguished from sale to a pipeline for resale) would have to prove his price was above cost.

Few new pipelines would be built. Consumer gas prices would rise. Field prices would be depressed. Gas wouldn't compete with coal.

THAT'S WHAT COAL WANTS. Can any gas man—producer, transporter, or distributor—find a conscionable area of compromise there?



Nickel alloy steel sucker rods kept this crew from going fishing

When a subsurface pump jammed, this crew had a pulling job to do. But that was all! No costly, time-consuming fishing job!

The nickel steel sucker rods didn't part when the pump jammed – demonstrating the strength and toughness of nickel alloy steel.

Oil Well Supply Division of United States Steel Corporation selects nickel alloy steels for high grade rods because they respond well to heat treatment . . . develop superior mechanical properties.

Pumping deep wells at excessive loads, nickel alloy steel sucker rods show high resistance to fatigue. When pumping corrosive wells, their combined resistance to corrosion and fatigue adds valuable pumping hours before replacement is necessary.

The tough jobs go to nickel alloy steels

Because of their performance record, producers depend on nickel alloy steels for long, reliable service – particularly in equipment where better than ordinary mechanical properties and corrosion resistance are needed.

Next time you're ordering material for that "toughest" job, keep nickel alloy steels in mind. And for help in selecting the right steel for the job, contact Inco's Development and Research Division. They'll be glad to work with you.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

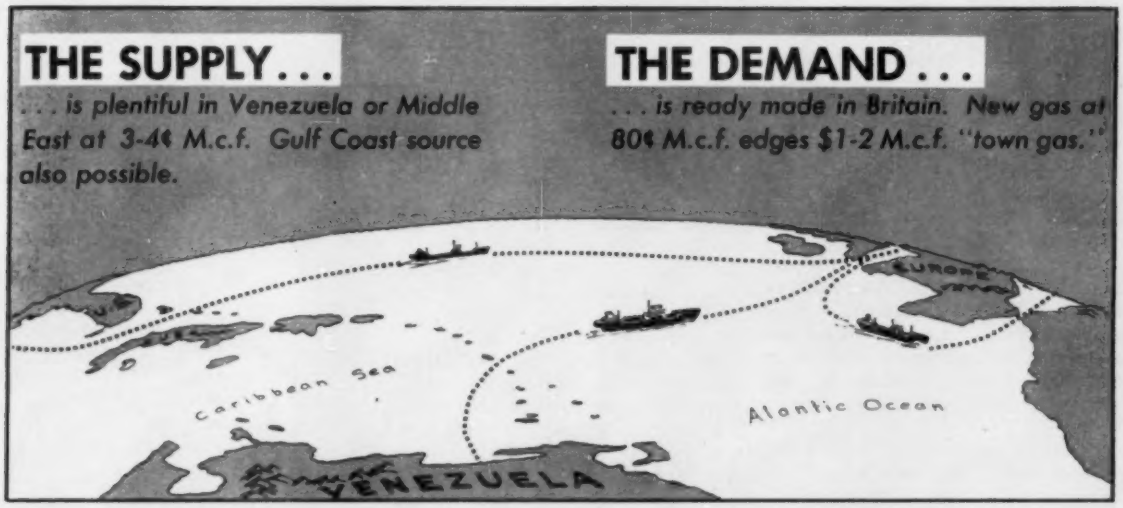
INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

the OIL AND GAS JOURNAL

December 16, 1957

England to Get Natural Gas by Ship


THE SUPPLY...
... is plentiful in Venezuela or Middle East at 3-4¢ M.c.f. Gulf Coast source also possible.
THE DEMAND...
... is ready made in Britain. New gas at 80¢ M.c.f. edges $1-2 M.c.f. "town gas."
EUROPE
Caribbean Sea
Atlantic Ocean
VENEZUELA

Continental is pushing this bold experiment. A ship is now being outfitted secretly to carry liquefied methane; costly facilities are being built near London. The results—due next year—could have a tremendous impact on the world's fuel-supply pattern.

WITHIN a matter of months, the first specially designed ship will load a cargo of liquefied methane and head across the Atlantic to England.

If all goes well and the known hazards are overcome, this pioneer effort is expected to mean:

... **A new source of cheap fuel** for energy-hungry Western Europe.

... **New competition** for fuel oil, manufactured gas, electricity, and coal in that region.

... **New markets** for waste or shut-in gases in the world's oil fields.

All the oil people involved in the experiment so far have been reluctant to discuss their work. They don't want the world looking over their shoulders while an experiment of such magnitude is being set up.

But from speeches on the floor of the British Parliament, from articles in the authoritative British press, and from trade sources in this country, this much is known:

... **Agreement is being negotiated** by British Gas Council and Constock Liquid Methane Corp., a company owned by Continental Oil Co. and the Chicago Stockyards Co., to undertake the experiment.

... **Necessary permits** to move liquefied methane into the Thames River area have been requested.

... **A ship is being converted** and specially fitted at Mobile, Ala., to move the gas.

... **Contract for a gas supply** from the Western Hemisphere is now being negotiated.

... **Special storage and pipeline** facilities are being built in Great Britain and a temporary market has been lined up.

When work is completed on the tanker and the British facilities, the shipment will start. This now is expected to take place sometime in the New Year.

Safety first . . . The overriding problem of the entire project is maintaining the —250° F. temperature required to keep methane in liquid form.

This requires special metal and insulation in the cargo vessel, storage tanks, and pipelines. If this problem is not conquered, the loss factor of liquid methane reverting to gas and the hazard of explosion involved would stymie the effort. Still fresh in the memory of everyone working on the problem is the Cleveland tragedy in 1944 when stored liquid natural gas exploded, killing 131 persons.

At any rate, Constock has contracted with Alabama Dry Dock &

Shipbuilding Co., Inc., at Mobile to convert a vessel to haul the liquefied methane. A 7,500-ton cargo ship will be converted and outfitted with storage tanks at a cost of $4,500,000. The tanks will be insulated with balsa wood in a thermos-bottle type construction.

Design and engineering work for the conversion is being handled by J. J. Henry Co., New York marine architects. The ship, according to the London Times, is the first ever adapted for ocean service with such a cargo. Barges designed to carry liquid methane up the Mississippi River were built by 1953 but never have been put into service.

The vessel will have four tanks providing space for more than 2,000 tons of liquid methane. The ship also will have to be specially ballasted. The reason: The cargo is exceptionally light. Liquid methane has less than half the weight of water for the same volume. The balsa-wood insulation also is light.

Other details of the new ship are being closely guarded. An Alabama Dry Dock spokesman said the work is going on in secret. No visitors are allowed. The spokesman said "we've had people from London and all over the world down here trying to take a look."

Alabama Dry Dock is handling the conversion on a man-hour basis. Work only recently started, and Constock opened an office in Mobile to supervise the changes. After completion, the ship reportedly will be operated for Comstock by Marine Transport Co., a private shipping company with experience in operating chemical tankers.

How many trials? . . . The methane first will be liquefied at a shore installation and then pumped into the ship's tanks.

Two rival liquefaction processes currently are under study. Either, however, will strip the natural gas of several hydrocarbons and impurities and then liquefy the methane (OGJ, June 10, p. 66).

No refrigeration equipment will be used on the tanker. The gas that vaporizes in the vessel during transit is expected not to exceed half of 1 per cent a day. This gas will run to waste.

In later ships, when 40,000-ton capacity and above is visualized, this waste gas will be drained off and used to drive the ships' main engines. This concept of using evaporating methane as engine fuel also was planned on the earlier river barges.

How many shipments will be needed to prove the experiment? Dr. J. Burns, chief engineer of the North Thames Gas Board, is quoted in the London Times as saying three shipments of liquid methane will do the job. They probably will provide the board with enough working experience to make long-term plans, he said.

Dr. Burns added that "given the necessary security of supply and assuming the trial is successful, it is reasonable to believe that orders for large methane tankers will be placed with British shipyards. Plans for such vessels already are being made."

Busy ashore . . . The first consignment of liquid methane will be taken by the North Thames Gas Board.

This agency has been asked by the Gas Council to assess the practicality of the process. This involves receiving the cargoes, storing the liquid gas, and converting it into gaseous form for general use in domestic and industrial appliances.

The minister of power has been asked to allow the tax-free import of the liquid. A site on Thames-side where a gas-holder permit already is available was selected for storage facilities.

Work has started on two unusual tanks to receive the liquid methane, according to the London Times. They are being built near the Regent Oil Co. jetty at Canvey Island, Essex. The tanks are 65 ft. high. Each will have an outer steel shell and an inner aluminum container. The space between them will be filled with a light volcanic rock to insulate the contents from outside heat.

Each tank reportedly will be partially buried and will hold 1,000 tons of liquid methane. Refrigeration will not be necessary. Evaporation in storage will run about the same small percentage as that aboard ship.

The 10-in. pipeline moving the liquid methane from ship to tanks will have a 2-ft. thick covering of insulation. Special pumps and valves also will be designed for the line.

As the liquid is allowed to revert to gas, it will pass through the new Essex gas main, perhaps mixed with rich refinery gas from Shellhaven and Coryton plants, and move to the Romford gas works for treatment. Then it will be fed into the North Thames Gas Board's distribution system.

In its final state, the gas from 2,000 tons of liquid methane stored in the two tanks will provide a little more than one million therms. This is equivalent to about 200,000 M.c.f. of "town gas" from 14,000 tons of coal. British manufactured gas is rated at 500 B.t.u. per cubic feet compared to 1,000 B.t.u. for natural gas.

British officials estimate that three 30,000-ton tankers making 15 journeys a year could bring enough gas to meet half of Britain's total requirements.

The cost . . . University of Michigan researchers studying the problem estimate a tanker load of liquid methane can be delivered in Great Britain at 80 cents per M.c.f. (OGJ, June 10, p. 66).

This compares with $1 to $2 per M.c.f. for manufactured gas.

The 80-cent price is based, however, on Venezuelan gas costing only from 4 to 5 cents per M.c.f. But even 20-cent Gulf Coast gas will be competitive.

These scientists estimate an investment of $112 million will be required to supply London with 200,000 M.c.f. daily of 500-B.t.u. gas from Venezuela. Facilities required are four tankers, each capable of carrying 15,000 tons of liquid natural gas; storage tanks of about 25,000 tons capacity on both the sending and receiving ends; gas pretreatment and liquefaction plants rated at 110,000 M.c.f. daily.

A larger project capable of delivering 400,000 M.c.f. daily would require an investment of $239 million, according to other estimates.

Both plans compare favorably with the investment required for gas-production and purification plants of conventional design in England.

The outlook . . . Future of liquefied methane, according to British engineers, depends on cost of gas at the source.

Both British and Americans consider the Caribbean area a prime source of gas, which is produced in association with oil and also from separate gas fields. This large supply of gas is expected to be available over a long period.

The Middle East also is considered a possible source (OGJ, Mar. 28, 1955, p. 80).

British actually envisage a possible new industry based on gas liquefaction. They consider other European countries, especially West Germany and Italy, as prime prospective customers.

Other possible industrial uses for the liquid methane also are seen. The liquid methane, for instance, could be used for large-scale refrigeration. The large amount of heat absorbed in changing from a liquid to gas state would do plenty of refrigeration work. The gas afterwards still could be available for fuel uses. It might also serve as raw material source of petrochemicals.

How it started . . . Much of the present

know-how in handling gas liquefaction has been picked up over the past 17 years in the United States.

East Ohio Gas Co. of Cleveland pioneered gas liquefaction in 1940 with the world's first such plant. This Cleveland plant liquefied the natural gas which was then stored for use in shaving peak-load demand.

East Ohio had aboveground storage for 240,000 M.c.f. of gas and gained 4 years of experience in the field before its tragic explosion in 1944. One of these storage tanks gave way on October 20, 1944, damaged an adjacent container, and released large amounts of liquefied gas into the air.

The liquefied vaporized and then ignited into a Bikini-like explosion. Every building on the 14-acre company site was demolished along with 200 dwellings in the area (OGJ, Oct. 28, 1944, p. 58).

The tragedy swerved the gas industry toward underground storage caverns to meet the peak-load problem and put liquefied gas to sleep for 9 years.

In 1954, a forerunner of the Venezuelan-British movement was a plan to barge liquid methane from Louisiana gas fields to Chicago. There it would be vaporized. This process would provide refrigeration for chilling and cold storage of meat at big packing houses near the Chicago stockyards. The gas then would go to a nearby power-generation plant for fuel. (OGJ, Mar. 22, 1954, p. 104).

The plan was proposed by W. L. Morrison, head of a Lake Forest, Ill., research organization. It had the financial support of William Wood Prince, dominant figure in ownership of both the Chicago stockyards and Armour & Co.

The Louisiana-Chicago movement has never come off. Last word on it was that the next step awaited results of Coast Guard tests of the barging. After that the Coast Guard must write safety regulations governing coastwise and river movement. The Coast Guard last week said it has drawn tentative regulations for this type of shipment but they still are under consideration.

Meanwhile, Continental Oil Co. and British officials became interested in moving liquid methane in ocean-going ships. Continental and Prince interests then formed Constock to work with the British agency on the present deal.

British officials for their part in the experiment have come under some criticism in Parliament. But they feel the possible stakes of a new fuel source are so high that the few millions spent on the test are well worth the gamble.

watching WASHINGTON

. . . with Bertram F. Linz

The employer and labor laws

THE ADMINISTRATION next year will ask Congress for labor laws which would control action of employers as well as unions.

Purpose of the measures will be to curb labor racketeering. But they also will aim at wiping out improper relationships between employers and union leaders.

Proposals outlined by Labor Sec. James P. Mitchell call for public disclosure of the operations of all health, welfare, and pension plans. Employers financing or contributing to such plans, as well as unions, would be required to report.

Plans also include requiring employers to report payments made to employe representatives, either directly or through a third party, which are prohibited by law. The particular target is the "sweetheart" contracts which the Senate rackets committee showed have been bought from union leaders.

The unions and their officers also will have to report their dealings with employers or employer representatives. The intent of this is to bring union-employer financial transactions into the open.

These provisions would be given teeth by making it a felony for either employers or unions, or their representatives, to make or receive payments to influence the actions of either.

The administration will also call for curbs on secondary boycotts and picketing. But it will not support a national right-to-work law.

Consent decrees here to stay

ANTITRUST POLICIES will not be affected by the recent change in leadership of the Justice Department.

This was made clear by Atty. Gen. William P. Rogers at his first news conference since succeeding retired Herbert Brownell, Jr., last month.

The department will follow "pretty much" the same policies as it has in the past, Rogers said. This will include the use of consent decrees "where they are in the public interest."

Rogers disclosed that the department is talking with several companies involved in the "cartel" suit pending in New York. A report that a consent decree was under study brought criticism from Sen. Joseph C. O'Mahoney of Wyoming last month.

The senator warned Rogers against settling the case without "full disclosure." He suggested that any settlement should be discussed publicly before the Senate judiciary subcommittee of which he is chairman before it is filed with the court.

Rogers did not indicate whether he would accept the senator's suggestion. But no settlement is likely to be reached before Congress meets next month. It is probable that he will inform O'Mahoney of the decree in order to head off later criticism.

Monopoly case may be set

THE JUSTICE DEPARTMENT now hopes to bring the long-pending West Coast monopoly suit to trial next spring.

A court hearing this week may bring a definite date for the Government's suit against seven major companies operating on the Pacific Coast.

The case, filed in 1950 in the southern California federal District Court, charges the companies with conspiring to monopolize and suppress competition at all levels of operations.

Failure of the department to press the case brought vigorous criticism from Congress earlier this year. Department officials denied that they had been lax. They had filed an amended complaint in August 1956, they said. The new complaint charged that the companies had used the consignment method of selling gasoline to further their effort to monopolize the West Coast industry.

Union Is Defeated Twice

. . . in first elections testing labor's new attempt to organize drilling-industry workers in Permian basin.

ORGANIZED LABOR suffered a double setback last week in its attempt to organize the Permian basin drilling industry.

Employes of two oil-well service firms rejected Local 672 of the International Union of Operating Engineers as their bargaining agent in the first of several elections expected to be held in the basin under supervision of the National Labor Relations Board (OGJ, Dec. 9, p. 63).

Employes of Williamson Well Service, Inc., Odessa, Tex., voted 35 to 25 against union representation on December 10.

A day later, crewmen for P. L. & B. Well Servicing Corp., also of Odessa, repudiated the union by an overwhelming 26 to 2 margin.

These so far are the only elections certified by the NLRB. The board, however, currently is studying union requests for elections among employes of five basin drilling contractors. And it has scheduled hearings on similar petitions for elections involving several more.

Basin drilling contractors were cautiously elated about the outcome of the elections last week. Though the firms involved were well-service firms, the majority of drilling contractors appeared to feel that the election results indicate that drilling crews would reject the union, too.

This feeling was based principally on the opinion of most that well-service employes should be easier for a union to organize than drilling crews —because of smaller per-hour pay, and unusually long work week, sometimes running to more than 80 hours, and heavier concentration of employes.

Election contest . . . O. W. Clark, union organizer at Odessa, appeared discomfited in an interview following the Williamson election.

He said, however, that the union wasn't conceding defeat. He said it would contest the results and ask for a new election on grounds that only 64 employes of 92 qualified actually voted. "We have 5 days to file objections with the board and will do so within that time."

The protest, he said, would be filed with the NLRB examiner supervising the election who would refer it to the NLRB office in El Paso. The board's regional office in Fort Worth will ultimately rule on the objection, he said, probably after the first of the year.

Williamson Well Service executives predicted that any such objection would come to naught. A company official said there were eligible employes who didn't vote but that "there aren't any regulations which require them to vote if they don't so choose."

What's ahead . . . In Odessa, organizer Clark maintained that whether the union wins a new Williamson election or not will make little difference in its over-all drive.

"We expect to lose some elections, but we expect to win some too," he said.

The union leader said he figures drilling crews will be easier to organize than well-service company employes, a view contrary to that held by both service and drilling contractors.

One of the reasons, Clark said, is that "we can show contractor drilling crews the much greater benefits going to oil company crews in the form of higher wages, shorter hours, paid vacations and transportation. These are arguments we haven't been able to use with well-service company people."

12 Producers in 6 Months

. . . That's the Innisfail story in southern Alberta, where six companies are fast developing the Devonian D3 reef.

SIXTY MILES north of Calgary a new field has mushroomed since last June into Alberta's fastest-developed discovery of the year.

Innisfail not only has 12 producing wells but has 9 others drilling and 23 more on the agenda for 1958.

The field has outpaced all of Alberta's 48 oil discovery areas of 1957 by tapping the Devonian D3 reef.

Innisfail actually is not considered Alberta's most important find of the year, although developing the fastest. Five discoveries in the Virginia Hills trend, northwest of Edmonton, have greater potential. But development has been slow because of muskeg.

In the wheat country of southern Alberta, however, drillers for six companies have moved ahead swiftly since Innisfail's discovery last June by Canadian Oil Companies, Ltd. The well, White Rose et al 1-16 Innisfail, flowed 509 bbl. per day on 15/64-in. choke at completion. It topped the D3 at 8,436 ft. and found 143 ft. of oil pay and 3 ft. of gas pay. Perforation was at 8,498 ft. to 8,518 ft. and total depth 8,650 ft. Gas-oil ratio was 1,367 ft. per barrel.

Potentials on the other wells also averaged more than 500 bbl. per day, varied at 75 to 180 ft. of pay, and averaged at about 150 ft. of pay.

One well also produced in the D2 (Nisku) of the Devonian.

Who's in the field . . . Canadian Oil Companies has four producers in Innisfail, has three others drilling, and has had one dry hole. The dry hole

apparently defined the southeast limit of the pool.

Other companies active in the field are Hudson's Bay Oil & Gas Co., Ltd., three producers, two drilling, and one abandoned wildcat; Canadian Superior Oil of California, Ltd., two producers and two drilling; Imperial Oil, Ltd., and Royalite Oil Co., Ltd., one producer each and one drilling; and Dernick Guyer, Inc., one producer.

The field now includes 7¾ sections. The field should grow since only the southeast limit has been defined. Oil reserves proved to date are estimated at more than 15 million barrels.

Navajos Get Record Bids

. . . for oil-attractive land in Four Corners. Carter pays all-time high price of $4,308 an acre for 240-acre parcel.

OIL EXPLORERS revealed with a record amount of cash last week the high regard they hold for 7,394 acres of Navajo Indian lands in San Juan County, Utah.

Oil company bidding set two records:

. . . A total of $8,123,867 in bonuses for the 33 tracts. This averaged $1,099.93 per acre.

. . . A record per-acre price of $4,308. This was paid by Carter Oil Co. to obtain one 240-acre parcel and is believed to be an all-time per-acre price for oil acreage. It meant Carter paid $1,034,040 for the single tract.

The previous record bid for Indian lands in the Rockies was $3,102 an acre paid by Pure Oil Co., Sun Oil Co., and Ohio Oil Co., jointly for a San Juan County tract at the Navajo sale November 1, 1956.

Why the interest? . . . The land involved in the bidding at Window Rock, Ariz., includes some of the best oil-prospecting acreage in the Rockies.

All but 12 of the 33 tracts lie in an area nearly ringed by producing oil fields. The fields are Aneth on the north, McElmo Creek on the east, White Mesa on the south, and Ratherford on the west. Just as important, recent drilling indicates the possibility of linking White Mesa, McElmo Creek, and Aneth. The remaining 12 tracts lie north of Aneth.

Other factors making the area attractive: Reserves averaging from 6,000 to 10,000 bbl. per acre. Pennsylvanian limestone pay zones at 5,500-6,000 ft. with average pay thickness at Aneth of 50-60 ft. Excellent possibilities for deeper production (OGJ, Sept. 9, p. 84).

The record bid came on a tract in the hottest spot in the area. The tract won by Carter over two other big bids lies northwest of McElmo Creek and between it and Aneth field. It is not far from two tight holes drilled recently by Superior Oil Co. and Carter on the fringe of McElmo Creek field.

Carter's record bid topped a $3,900-per-acre joint offer by Phillips Petroleum Co. and Aztec Oil & Gas Co. and a $3,753.13 offer by The Texas Co.

These same bidders also went after five other tracts in the same area west of McElmo Creek. Texaco got three 160-acre tracts with bids of $3,041, $3,753, and $3,041 per acre. Carter picked up another 160-acre tract with a bid of $1,907. The Phillips-Aztec combine got the last in this particular area at $3,900 an acre for 200 acres.

Texaco gets most . . . The Texas Co. actually picked up the most acreage in the bidding.

Texaco was successful in getting 2,794 acres at a total bonus of $4,261,438. The company as a result took 11 of the 33 tracts up for leasing.

This development may open interesting possibilities of which direction the crude will move if Texaco proves the acreage productive.

Texaco is one of the owners of Texas-New Mexico Pipe Line Co., now being built from the Four Corners area east to Jal, N. M. This line is expected to compete for crude with Four Corners Pipe Line Co., being built to move crude west to the Los Angeles refining area (OGJ, Dec. 9, p. 66).

Besides showing an interest in the McElmo Creek area, Texaco also engaged in a tussle with the Phillips-Aztec combine for acreage between McElmo Creek and Ratherford fields.

Texaco picked up one 160-acre tract here for a bid of $2,197 and another 240-acre parcel at $3,753. Phillips-Aztec won three others: a 240-acre tract for $2,600; a 200-acre tract for $3,900; and a 160-acre piece for $3,150.

Gasoline Plant Planned

PRODUCERS IN LAVERNE field of northwestern Oklahoma are flanging up plans for a big jointly owned gasoline plant to process gas from the field.

The plant will have a capacity of roughly 100,000,000 cu. ft. daily. It will produce about 100,000 gal. of liquids daily. A 40-acre plant site has been purchased 2 miles west of Laverne community. The plant will be completed by spring of 1959.

Sun Oil Co., largest acreage holder in the field, will operate the plant. Other owners in the field are Pan American Petroleum Corp., Sinclair Oil & Gas Co., Cities Service Oil Co., Shell Oil Co., Union Oil Co., Oklahoma Natural Gas Co., Kerr-McGee Oil Industries, Inc., Anderson-Prichard Oil Corp., and other smaller operators.

Residue gas will be sold to Michigan-Wisconsin Pipe Line Co. The latter will lay a 40-mile, 20-in. lateral to the plant from its main line from the Hugoton-Panhandle area to the northeast.

New School Grant

by Jersey will encourage science education in grade and high schools.

"IT'S EASIER to make money than it is to give it away intelligently."

With that provocative statement, Eugene Holman, chairman of Standard Oil Co. (N.J.), outlined plans of the Esso Education Foundation to give away an extra $1,500,000.

The extra fund is a special gift set aside by Jersey as part of its seventy-fifth anniversary celebration. It will be given to schools throughout the country over a 3-year period.

Holman pointed out that his company's foundation had planned the gift "before sputnik," but added that the program is even more in tune with the times now than when originally planned.

The first $500,000 of the special fund is going to 84 schools and is meant to stimulate science teaching at elementary, secondary, college, and graduate-school levels.

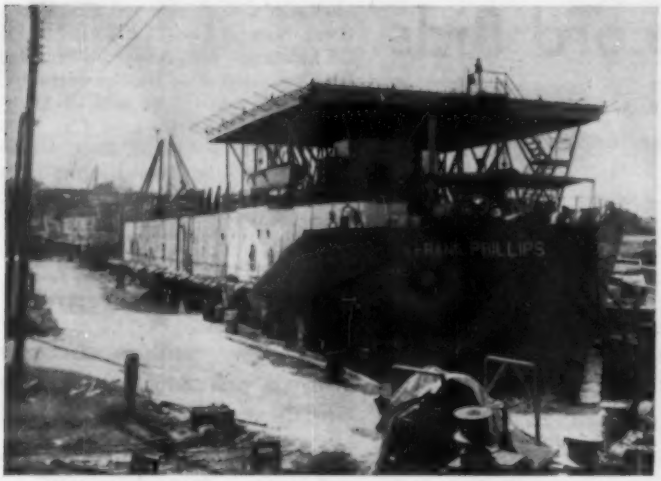
This is the first time Jersey's aid to education has dipped to the elementary and secondary-school level.

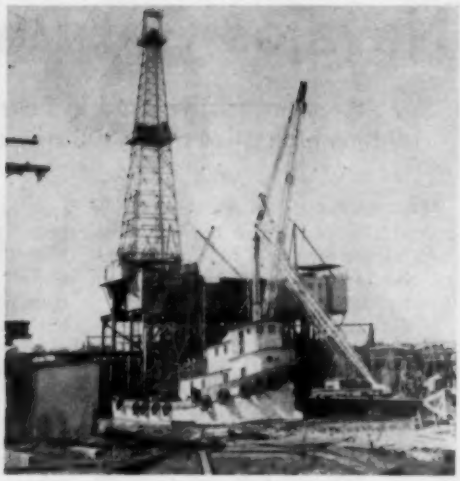
More aid needed . . . The Jersey chairman said that Jersey and six of its domestic affiliates will have given $5,500,000 in unrestricted grants to education in this country since the foundation was born in 1955. He said he hopes that Jersey's action will prompt more industrial firms to come to the aid of sicence education.

His own associates in the business world have convinced Holman that there is "a keen awareness in industry of the need for such contributions to education by business."

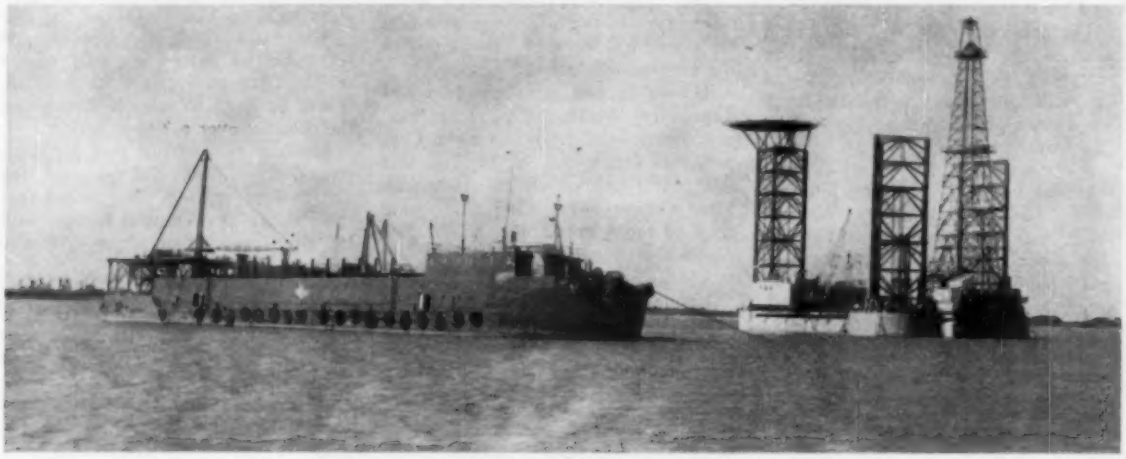
Almost $185,000 of the first half million so far committed in the special anniversary fund is in five grants to colleges and universities conducting special summer sessions for high-school science teachers.

The big problem, Holman says, is not finding the money to contribute, but in deciding just how it best can be donated to the right schools so it will do the most good.





Stacked rigs tell why offshore drilling contractors are taking a beating. Kermac has two tenders, above left, and a big platform stacked in Louisiana ports. Deep water units, like a Zapata Off-Shore unit tied up in port, below, are the least in demand.



Gloom Has Replaced Offshore Glamor

● Drilling contractors are taking a real beating in the Gulf of Mexico. Oil operators have suffered the past year, too, but most of their problems are temporary. The long-range outlook offshore is still bright.

Joe Reilly
Houston District Editor

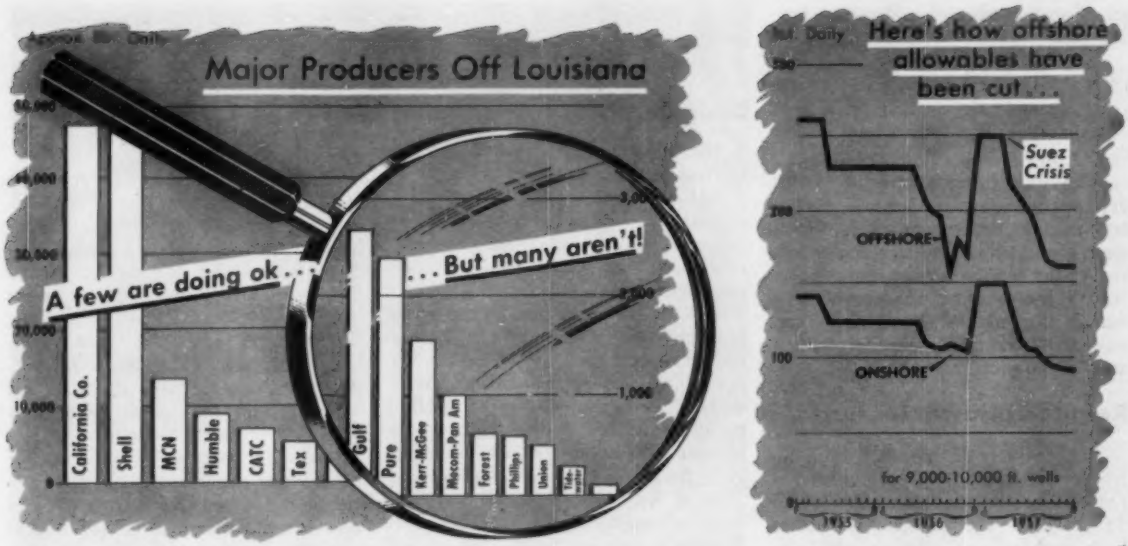
IT'S HARD THESE DAYS to find an optimistic offshore oil operator. His gloom, generally speaking, is about as thick as the fog which blankets the rigs on still winter mornings in the Gulf of Mexico.

Once among the world's most aggressive gamblers, offshore operators are now spending more and more time pondering their hole cards. In many cases the hole cards don't look nearly so impressive as the antes. Kibitzers tell of one company, for example, which has gambled more than $125,000,000 on offshore oil and gas while winning only about a dozen pots in the form of producing wells.

Playing long odds is nothing new to the companies which have waded offshore. During their few years' experience in the Gulf of Mexico they have had to fight constantly for survival. Politics, which kept them out of water for years, still has them bowing to two masters. The elements, too, continue to take their toll as is evidenced by the four platforms and drilling barges wrecked during the past year.

Cause of the growing pessimism offshore is a very basic one—economics. It's not a new factor, of course. It was considered long and hard before the first leases were bought.

But, recently, the prospects of a payout offshore have grown dimmer and dimmer for many operators. Production cutbacks account for a large share of the newborn gloom. But even if allowables were suddenly doubled, some of the participants still would be disappointed in the results off-



Millions have been poured into developing Louisiana's tidelands, but daily production is still small in most cases (left chart). But all operators have suffered from drastic cuts in allowables (right chart).

shore. Many of them simply have not found their share of oil or gas.

The drilling contractor has been most suddenly hit by the new gloom. Competition is becoming fierce as a result of the decline in drilling. The offshore contractor is now faced for the first time with the threat of cut-throat bidding.

Despite all the current pessimism, the over-all outlook for the oil industry in the Gulf of Mexico is rather encouraging. The present slump has given operators a half-welcome breathing spell. Their revenue has slumped, but expenditures have dropped much more sharply.

To the beginning of this year, the oil industry had invested an estimated $2 billion or more offshore, most of it off the coast of Louisiana. Oil and gas production to date has brought an income estimated at less than $500,000,000.

Proved reserves in the gulf are estimated by Bouwe Dykstra, Shell Oil Co. vice president, at about 800,000,000 bbl. of oil and 5 trillion cubic feet of gas. If this estimate is as low as is customary in new oil provinces, the money may prove to have been very well spent. Already, the estimate of gas reserves has been raised by one expert, Ralph E. Davis, to 12 trillion cubic feet (OGJ, Dec. 9, p. 70).

While expenditures have been leveling off, potential production and proved reserves have been gradually climbing. The investment trend is likely to continue until the federal Government holds another lease sale. The production and reserves picture should improve for years to come.

There have been three major changes in the offshore economics trend this year. All three are on the liability side. But at least two of them are expected to be temporary.

The biggest change probably has been the cut in allowables. This is closely rivaled, though, by the decline in wildcatting.

While it's generally agreed that both conditions are temporary, the third factor—rising costs—probably will become worse. Even in that category there's hope that improved technology gradually will reduce the cost of finding, producing, and transporting a barrel of offshore oil.

Contractors face hard year

A leveling off in tidelands drilling was inevitable. As was to be expected, wildcat drilling was hit first.

But, in the present gloom, it's frequently forgotten that 1957 has been a record year in offshore drilling.

Statistics compiled by a major oil company list 526 wells drilled off the Texas and Louisiana coasts during the first 9 months of this year. This figure for the first three quarters already surpassed the total of 505 for the entire year 1956, itself a record breaker.

Offshore well completions for the current year will total about 650 to 675. That will represent a gain of roughly 25 per cent over the previous record set last year. It will be more than three times the completions of 1954.

Forecasts by major operating companies indicate a considerable decline in offshore drilling during 1958. One of them—Magnolia Petroleum Co.—has projected nearly a 50 per cent cut in its own activity. Other major operators and contractors plan to cut, also, but not so drastically.

There are some, like George Kitchel of Kerr-McGee, who expect a mild upward trend after January 1. But most agree that next year's drilling rate is likely to average close to the present level, which is 30 per cent below the peak. That could make 1958 the second best year in history for the offshore contractor.

Obviously, that's not good enough to solve the contractor's financial problems, for he's had trouble keeping his head above water even in this record-breaking year.

There are a few rays of hope for the contractor:

. . . One tender already has been moved from the Gulf of Mexico to drill in the Gulf of Paria off Venezuela, and Kerr-McGee has made tentative plans to move a submersible barge to Panama. There also is talk that half a dozen more drilling vessels soon may leave the gulf for more promising waters in Venezuela's Lake Maracaibo.

. . . Another lease sale by the federal Government would increase the demand for offshore rigs. Officials have indicated, however, that a sale will be postponed until after July 1. In that case, it would have little effect on the year's drilling, though it might signal better days ahead.

. . . Drilling rates have remained fairly stable. As long as this trend

continues, contractors can stand a few idle rigs.

As far as the operator is concerned, 1958 looks like a relatively good year. It should be the best yet if production allowables are raised in the deeper water.

With wildcatting almost discontinued, operators can get more wells for less money. Several pipelines which have gone into operation recently will reduce the cost of moving oil to shore. What's more, some are providing a market for natural gas, which can now start paying its share of drilling and exploration costs.

Reduced allowables hurt

Since March of this year the Louisiana Conservation Department has reduced production allowables about 35 per cent. This cutback applied to both onshore and offshore wells, including those of federal leases. Most of the other prorating states made comparable cutbacks.

Offshore operators have been favored with larger per-well allowables. Because of this bonus, they have been harder hit in actual reductions measured in barrels per day. A typical 9,000-10,000-ft. offshore well with an allowable of 250 bbl. daily during the Suez crisis has been cut back to 162 bbl. daily. This amounts to a reduction of 88 bbl. per well (see chart). The cutback for a comparable well onshore, though cut about the same per cent, is only 52 bbl.

Offshore operators have suffered, from lower allowables since the middle of 1956. During that period the offshore allowable for a 9,000-10,000-ft. well has been cut about 17 per cent compared with 10 per cent for an offshore well.

Because of intensive development, offshore fields are now producing about 15,000 bbl. a day more than they did with higher allowables before the Suez crisis.

Except for abnormally high demand created by closure of the Suez, offshore production today would compare very favorably with that of a year ago. The Suez crisis puts current production figures in a bad light. Offshore production soared to an average of more than 160,000 bbl. daily during March, compared with about 140,000 bbl. at present.

Yet the Suez holiday did more than establish high production records to be looked back on with envy. It gave the offshore operator his moment of glory, proving the value of his excess producing capacity during perilous times. It also gave a few months of relative prosperity to one segment of the industry which has seen few days when income would match expenditures.

Deepwater rigs go begging

The plight of offshore drilling contractors is serious.

As might be expected, the latecomers have been hardest hit. Some of them, faced with huge payments on multimillion-dollar rigs, are threatened with bankruptcy.

Not long back, a contractor could build a $3,000,000 deepwater rig and have it signed up for a year's drilling before it was commissioned. With drilling rates ranging up to $7,000 or $8,000 a day, it didn't take many months to build up a respectable equity in the rig. It was time then to build another one.

This building boom has backfired. Estimated demand for deepwater rigs was far too optimistic. Today, the most expensive drilling units are in least demand.

There are four mobile drilling units available in the Gulf of Mexico for work in water 100 ft. or more in depth. Two of them are idle. Six more are under construction, pointing to future chaos. At least one more has been announced but probably will not be built.

Almost without exception, the deepwater barges are owned by companies which have no production revenue to tide them over during drilling slumps. Most of these vessels are relatively new and have not had a chance to pay for themselves. They cost up to $6,500,000.

Oldtimers in the offshore drilling business have equipment designed mostly for operations in water of shallow or medium depths. This group includes big oil producers such as The California Co. and Kerr-McGee Oil Industries, Inc. Also included are some stalwart firms bolstered by onshore production, a diversified drilling business, or an affiliation with inland producing companies.

A recent survey by Kerr-McGee points up the relationship between water depths and economic woes for offshore contractors.

The survey shows that there were six submersible drilling barges available for work in water 25 ft. or less in depth. Five were operating and only one was idle.

Among rigs designed for maximum water depths of between 25 and 50 ft., five were operating and four were idle. Two more were under construction.

For maximum water depths of 60-80 ft. there were nine operating and at least three idle. Two other units were under construction, and one was being converted to a tender platform.

Two submersibles designed for more than 80-100 ft. of water were listed as active while at least three were idle. Work has started on six more.

Operators furnish most of the equipment for drilling from stationary platforms. Of the 35 drilling tenders owned by operators, only seven were listed as idle. Six of the 12 tenders owned by contractors were out of work.

There are also about 40 self-contained stationary platforms in the gulf. Approximately 25 still contain rigs, with most of the others being converted to production platforms.

Although drilling in the Gulf of Mexico has slumped sharply since last summer, the number of active rigs now is almost on a level with a year ago. But since the first of the year about 20 rigs have been added to the offshore fleet, and construction is under way on at least 10 more.

Meanwhile, the number of active rigs has dropped from a high of about 118 in February to 81 in November. Approximately 25 portable rigs are now idle, and drilling equipment has been moved from several stationary platforms.

Further reducing the demand for contractor rigs is the fact that most of the decline has been in wildcat drilling. There were 24 active wildcats off Louisiana alone early this year. By the end of September the number had dropped to seven.

Outlook: Glamor to return

Long-range outlook for the Gulf of Mexico has changed very little in the past year or two, although the prospects for individual companies has fluctuated enormously.

The wildcat success ratio this year, even after many of the primary prospects have been drilled, stands at about 30 per cent. Experts still are predicting total potential reserves in the gulf at about 10 billion barrels of liquid hydrocarbons and at least 50 trillion cubic feet of gas.

Imports have hurt. But, except for the period during which Middle East supplies were cut off from Europe, there's more cause for rejoicing by domestic producers now than there has been for some time.

With a little increase in domestic oil demand, the offshore province may suddenly regain some of its glamor next year. For optimism is almost as contagious as pessimism. And even the pessimists are convinced there's lots of oil under the gulf just waiting to be found.

Flames roar skyward at New Orleans tank farm, where . . .

Two Fires Cripple Refinery

TWO BLAZES within 2 days swept through one section of Ingram Oil & Refining Co.'s tank farm near New Orleans, seriously threatening the company's 15,000-bbl. refinery and nearby residential areas.

The first fire erupted December 4 when gasoline burst into flames in a big storage tank. It spread to nearly a dozen other tanks and consumed about 100,000 bbl. of petroleum products before being brought under control 12 hours later.

F. B. Ingram, assistant to the president of the company, credited the bravery of five Ingram workers for helping contain the fire within the storage and blending section. The employes, clad in heat-resistant firemen's suits, succeeded in their second attempt to close the valve on a gasoline tank which fed the spreading flames.

One refinery worker was killed in the fire.

The second fire broke out in one of the collapsed gasoline tanks and spread to two other tanks December 6 before being extinguished about 2 hours later. During the height of the second fire, strong winds whipped the flames in the direction of a 55,000-bbl. tank containing high-octane gasoline.

Men and equipment to control the blazes were rushed to the scene by the Navy, Coast Guard, National Guard, and Air Force. Civil defense volunteers and hundreds of firemen from New Orleans and St. Bernard Parish also aided in the emergency.

A company spokesman estimated that about $400,000 worth of gasoline was destroyed. Property damage was placed at approximately $500,000. At least 3 months will be required to get the plant back on full production.

Oil Union Offers "Foolproof" Tip on Stock Market

THE OIL, Chemical and Atomic Workers International Union is making money on Wall Street.

The union owns one share of stock in every company with which it has a contract. And at the end of the fiscal year these stocks, which cost $7,482 originally, were worth $13,475. In addition, OCAW earned $567 in dividends during the fiscal year.

The union cited the figures in offering its membership a "foolproof" formula for making money in the stock market.

"You need only one simple item of information about a company before you buy stock in it," OCAW said. "Are the company's workers organized in a good strong union?"

Actually, OCAW bought the stock in order to acquire company reports on finances and operations for use in bargaining sessions.

—— *Industry* briefs

The Navy will drill six shallow wells at Teapot Dome to determine whether oil is being drained from the east flank of the 9,480-acre Wyoming reserve. The tests will go to the 1,000-ft. Shannon zone which is productive in the nearby Salt Creek field. The reserve, which is about 40 miles north of Casper, has been dormant for years. The Navy withdrew the land in 1915 as a future supply of petroleum for military use.

Richfield Oil Corp. will increase capacity of one of its tankers by 25 per cent in the West Coast's first jumboizing tanker project. Todd Shipyards Corp. at San Pedro, Calif., will add another 48½ ft. to the length and 7 ft. to the width of the tanker "David E. Day." The new hull will be 354 ft. long, 75 ft. wide and 39¼ ft. deep. The vessel will be out of service only 60 days.

Producing Properties, Inc., last week paid out $450,000 for two producing properties in Texas. The company bought interests in three wells in Yates field of Pecos County, West Texas, from Mrs. Roberta P. Dickson of Austin for $250,000. It paid $200,000 for the full working interest in two wells on the George Jones lease in the Gregg County portion of East Texas field to Joseph D. Ambrose et al of Fort Worth. The company estimated the two purchases increase its reserves by about 520,000 net barrels of oil.

Independent gas producers will be given an additional month in which to prepare reports for the Federal Power Commission on their 1956 sales and revenues. The FPC announced last week that the deadline for filing has been extended from December 31 to January 31. The action came as a result of protests that the producers had not been given sufficient time to work up their data for the new report form prescribed by the FPC November 19.

Legislation paving the way for the building of a refinery on Sand Island, Hawaii, is being pushed by the Interior Department. A bill has been drafted which would transfer 202 acres of the island to the Hawaiian government, which could sell the land by competitive bidding. Sand Island, which is near Honolulu, has been a military reserve, but the Defense Department has agreed to the plan to turn the land over to the local authorities.

Ike Again Backs Texas

. . . in state's claim of 3-league boundary. Government's policy in pressing case against gulf states may change as result of President's letter to Texas committeeman.

THE JUSTICE DEPARTMENT is taking a cooler view of its suits to seize the Continental Shelf oil lands claimed by the Gulf Coast states.

Atty. Gen. William P. Rogers intends to go through with the cases started by his predecessor, Herbert Brownell, Jr. Rogers said last week however, that the briefs to be filed by the department with the Supreme Court will show the historic background of the claims of Texas, Louisiana and Florida to a 3-league boundary, the legislative history, and all other pertinent facts.

Rogers went so far as to make available a letter written by President Eisenhower to H. J. (Jack) Porter, Texas national Republican committeeman, supporting that state's boundary claim.

The Justice Department head, insisting there was nothing inconsistent with the President's stand in the cases now before the court, said a decision on the issue may "not necessarily be the same for each state."

His remarks were interpreted in some quarters as reflecting a belief that Texas has a better claim to a 3-league boundary than Louisiana and Florida, which also claim that limit. He refused to clarify the point, however.

Up to court . . . The main question, Rogers said, is what Congress meant when it passed the 1953 tidelands act returning to the states their seaward lands "to the 3-mile limit or their historic boundaries."

The President, consistently since 1952, has supported Texas' claim to a 3-league boundary. But in recent letters to Sen. Lyndon Johnson of Texas and to Porter, he pointed out that it is a proper matter for the Supreme Count to pass on.

"It has been and still is my considered view that Texas should have the right to explore and exploit those submerged lands which extend seaward of her coast line into the Gulf of Mexico for a distance of 3 marine leagues," Eisenhower said in his letter to Porter.

"I must say it is regrettable that Congress did not follow the administration's recommendations for making this clear, but instead left the law ambiguous so that the matter had to be litigated.

"As I have said before, it is my earnest hope that the Submerged Lands Act establishes Texas' 3 league historic boundary as a matter of law. Whether it does, as we all realize, is a proper matter for the Supreme Court to consider and decide.

"In this connection, however, you should know that, in presenting the issues to the Supreme Court, the Department of Justice will also present the statements I have publicly made in the past which bear upon this controversy and also those of the attorney general which, as you know, were in accord with my own."

Switch in strategy . . . Observers saw in Rogers' views a conflict with those expressed in petitions and briefs filed with the Supreme Court by Solicitor General J. Lee Rankin during Brownell's tenure.

It had been the consistent claim of the department, expressed orally before the court last winter in the Louisiana case, that no state can have a boundary beyond that of the United States. The 3-mile limit, it was held, represented the limit for any coastal state.

Texas and the other coastal states were brought into the Louisiana case this fall by a Supreme Court order. It instructed the Justice Department to "invite" them to participate and to bring them in by complaint if they declined.

The court's apparent idea was to wrap the whole boundary question in one package and decide the boundary for all five Gulf states in a single decision.

Rogers, however, said the line would be decided separately for each state. He said the brief to be filed by the Government would not lump them all together. Instead, the manner in which each state entered the Union will be detailed, together with its boundary claims.

A recital of the history of the legislation as it went through Congress step by step will show what House and Senate had in mind in passing the tidelands act. At the time, the Louisiana delegation sought to have the actual boundary outlined in the measure, warning that a legal contest might result from failure to do so.

Rogers said all other "pertinent" facts, including Eisenhower's statements and letters on the subject, also would be laid before the court.

Texas hopeful . . . The President's letter to Porter raised the optimism of Texas officials.

Texas Atty. Gen. Will Wilson said he now has hopes the suit will have a happy outcome for the state. However, he contended the Supreme Court could not compel Texas to become a party to the present suit.

"It seems to us that the policy of this administration is running squarely to the contrary to the view of the President on this subject," he observed.

Gov. Price Daniel recently wrote the President that actions of some of the key officials in his administrative family (specifically the solicitor general and attorney general) were contrary to the President's public assurances that he regarded Texas' claim to a 3-league boundary a valid one.

Daniel now has gone a step further to defend the Texas claim. He has allocated $100,000 from the governor's emergency fund to finance the state attorney general's defense of the 3-league boundary before the Supreme Court.

The Texas governor also announced he would name within a few days a committee to study the effect of oil imports on Texas' economy. The committee will recommend what action the state should take to offset any harm resulting from high imports.

New Ethylene Line

to connect Louisiana plant with Texas manufacturers.

A LOUISIANA petrochemical plant soon will start deliveries through the first interstate pipeline ever built to transport high-purity ethylene.

The 30-mile 6-in. pipeline, now nearing completion, will deliver ethylene from the Lake Charles plant of Petroleum Chemicals, Inc., to two customer companies at Orange, Tex.

Petroleum Chemicals, owned jointly by Cities Service Co. and Continental Oil Co., is now completing a plant capable of producing 200 million pounds of ethylene annually.

The Orange terminal will serve E. I. du Pont de Nemours & Co., Inc., and Spencer Chemical Co.

Ethylene will enter the line at 1,000 psi. and will be delivered from the Orange terminal at a pressure of 450 psi. As a result, the line may be used

as a storage facility. When deliveries are reduced, the line can be filled to 1,000 psi. to provide extra capacity for periods when deliveries are large or the manufacturing plant is not operating at capacity.

Refinery gases from nearby plants of Cities Service and Continental will be used in manufacturing ethylene. The chemical is used in manufacture of a wide variety of products, including polyethylene plastics, antifreeze, synthetic-rubber products, tetraethyl lead, and liquid detergents.

New Crude Line

will tap fields in Kansas-Oklahoma Panhandle area.

JAYHAWK PIPE LINE CORP. has been organized to build a 242-mile, 10 and 12-in. crude line from western Meade County, Kansas, to Valley Center near Wichita.

Backers are Colorado Oil & Gas Corp., parent company of Derby Refining Co., and National Cooperative Refinery Association. Derby has a 16,000-bbl. refinery at Wichita and NCRA has a 28,000-bbl. plant at McPherson along the proposed line which will cross Meade, Clark, Kiowa, Stafford, Rice, and McPherson counties, then drop southward to Valley Center. J. W. Meehan, vice president of Derby, is Jayhawk president.

The line will provide an outlet for 15,000 to 20,000 bbl. of crude daily in an area of southwestern Kansas and northwestern Oklahoma which has been without a market much of this year. Ultimate capacity will be 45,000 bbl. per day.

Pipe Line Technologists, Houston, has the engineering contract for the line, which will consist of 200 miles of 12-in. and 10 miles of 10-in. The project, if approved by the Kansas Corporation Commission, would be built next spring. An application was filed last week.

Other proposed projects . . . Jayhawk is the fourth pipeline proposed since Shamrock Oil & Gas Corp. stopped purchasing in the area April 1 when its Texas Panhandle connections exceeded market demand.

Southern Kansas Pipe Line, Inc. (Aladdin Petroleum Corp. and Anderson-Prichard Oil Corp.), Sunflower Pipe Line Co., and Oil Field Pipe Line, Inc. (Musgrove Petroleum Corp., Inc.), have announced project studies. Southern Kansas would build a line to Arkansas City, and Oil Field would build to the Schurr station of Arapahoe Pipe Line Co. near Ellinwood, Kans. The Jayhawk line has been the most actively pushed in recent weeks.

Imports Plan for West Coast

. . . will go into effect in January. New control program will probably follow pattern set up for other districts.

WEST COAST crude imports will be put under a voluntary control program January 1.

Recommendations based on a 2-day hearing last month were sent to the cabinet committee last week by Capt. M. V. Carson, imports administrator.

It was expected that the President would sign the committee report before he left Friday for the Paris meeting of NATO.

Carson did not disclose the trend of his thinking. But observers said the 1958 schedules submitted by the West Coast importers at the hearing left little doubt that cutbacks would be found necessary.

Importers for the first half of next year on the West Coast called for an average of 348,000 bbl. daily. That's an increase of 73,800 bbl. above the 275,000 bbl. which the committee said last July was expected to be brought in daily during the last half of this year.

Indications in Washington are that the allocation for the 6-month period will be fixed at 220,000 to 235,000 bbl. daily.

A cutback of this dimension would drop imports well below the 275,000 bbl. daily average of this year. But an additional 40,000 bbl. or more daily is expected to flow from the Four Corners area soon.

Industry reports now reaching Washington also indicate that imports have dropped from their recent high point to a level of around 240,000 to 250,000 bbl. daily.

Same plan . . . The plan for cutting imports into District 5 is expected to follow the lines of that already in effect for the other four districts:

. . . Older importers will be given allocation based on past imports.

. . . Newer importers will be given a maximum by which they can increase their imports over last year.

. . . Those just starting to import will be given quotas not exceeding the increase given to companies which recently began importing.

Because of the smaller field, it is expected that the increase given recent importers and the quotas for newcomers will be somewhat less than the 12,000 bbl. allowed similar groups under the existing program.

The figure is expected to be 3,000 bbl. a day.

FPC to Launch Gas-Rate Study

. . . at January hearings. New probe stems from old Tennessee Gas case and includes all independent-producer rate schedules now on file with FPC.

AN INVESTIGATION of rates charged by independent producers for gas sold in all areas to interstate pipelines will be the first order of business for the Federal Power Commission next year.

The study will begin at hearings January 7 at which time the FPC will analyze all independent-producer rate schedules on file with the commission.

The inquiry is an outgrowth of a 3-year-old investigation of the rates of a group of producers who sell gas to Tennessee Gas Transmission Co.

To speed up and supplement that case, the producers involved entered into a cooperative effort, at the suggestion of the FPC staff, to brief all the schedules. The survey will be complete for all areas except the Appalachian area, where coverage will be representative but not complete.

The aim is to make available evidence as to the rates, charges, terms, and conditions under which gas is sold in the several producing areas.

The FPC noted that collecting the data required much time and effort, as well as considerable cost, but added that the survey "should substantially aid in expediting the respective proceedings."

After the basic evidence is received at next month's hearings, the FPC staff, the producers, and other parties will be allowed to present analyses or interpretations of the rates.

The producers involved in the rate hearings which led to the general survey are Champlin Oil & Refining Co., Pan American Petroleum Corp., Continental Oil Co., Western Natural Gas Co., Atlantic Refining Co., Humble Oil & Refining Co., C. V. Lyman of Midland, Tex., Sinclair Oil & Gas Co. and Tidewater Oil Co.

Hearty whack with a two-by-four merely dulls the gloss.

Tough New Coating

. . . is being applied to line-pipe exterior on a big scale for the first time. It requires new techniques, but it holds promise of cutting costs as much as 20 per cent.

TRANSCONTINENTAL Gas Pipe Line Corp. is applying a revolutionary coating for protecting the exterior of pipelines.

The new sprayed-on material sets faster, bonds tighter, and is tougher than most conventional pipeline coatings.

Because of this, the coating is not damaged by ordinary handling, hauling, bending, and laying operations. As a result, it may be possible to lay pipe coated with this material with little more care than is used in laying bare pipe.

The coating could mean a saving of as much as 20 per cent in laying cost on large-diameter lines.

Field and laboratory tests indicate that the coating—only 10 to 12 mils thick—will not deteriorate in the ground as do some coating materials. If this proves true, the new coating will also cut the cost of operating pipelines. Too, the coating should not be any more expensive to apply than most present materials.

Transco is coating several miles each of 3, 4, 10, and 16-in. pipe at a yard near Tilden, Tex., for use in a gas-gathering system.

New tricks for old dog . . . The coating being tested is a combination of epoxy and coal-tar resins.

Such coatings have been used in recent years to protect the inside of crude-oil tanks, the interior of line pipe, and the outside of offshore equipment. They have also been used, on a small scale, to coat the exterior of small-diameter marine gathering lines.

Sold under the trade name Copon Arocoat by Coast Paint & Lacquer Co., of Houston, the coating is actually an equal mixture of two different liquids. One is the base stock; the other, a blending resin. Separately, each remains fluid.

When mixed together, they yield a smooth, homogeneous fluid which can be sprayed, but which dries quickly. Drying time depends on temperature. At Tilden, where the pipe is heated to about 165° F., the coating hardens enough for ordinary handling in 12 to 15 minutes.

Four big problems . . . When they saw how epoxy-coal-tar coatings worked elsewhere, Transco engineers began thinking how it might be applied to the outside of pipelines. At first, it looked as if the problems involved could stymie the whole idea.

First, for the coating to bond well, the pipe has to be cleaner than ordinary cleaning machines can make it.

Second, for the coating to set as fast as needed for field handling, the pipe has to be heated.

Third, if the spray equipment shuts down for more than 3 or 4 minutes, the coating sets up in the machine and plugs everything tight.

And fourth, ordinary spray equipment, while good enough for small jobs, didn't appear adequate for large-scale work like coating many miles of big-inch pipe.

Transco presented the problems to several coating contractors and asked for prices.

H. C. Price Co., Bartlesville, Okla., working with Coast Paint & Lacquer, was willing to tackle the job and was awarded the contract. The contractors soon were putting the coating on successfully and on a routine basis.

Cleaning . . . Price solved this problem by using a shot-blast machine.

While the machine is capable of blasting to white metal, that was not necessary.

By using a combination steel grit, the machine removes all dirt, rust, and enough scale for the coatings to bond tightly. And it does it quickly enough to keep up with all other operations.

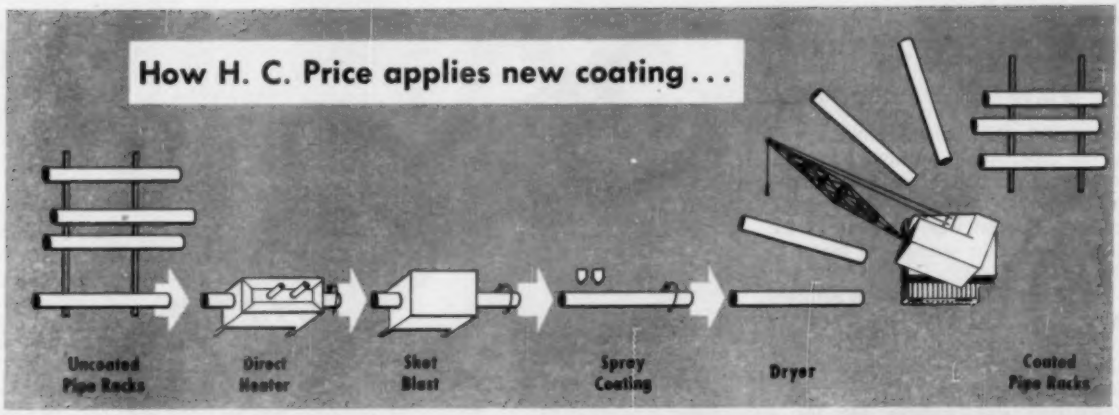
Heating . . . Price solved this problem quickly, too. It adapted an upright heater to burn diesel oil and to handle the pipe in a continuous movement.

The flames impinge directly on the pipe and heat it to 170° to 190° F., depending on atmospheric temperature. So that pipe coming to the spray station will be clean as possible, Price has put this heater before the shot-blast machine.

Spraying . . . In getting the Tilden yard into smooth operation, most of the trouble has been in the spraying process.

All equipment had to be especially constructed. Price doesn't feel that its present arrangement is the best possible, but is satisfied with it as a "first-time" rigup.

The two Arocoat fluids are fed



HEATER was specially designed to handle pipe continuously. Pipe enters at right, passes to shot-blast cleaning unit at left.

COATING UNIT sprays an even, liquid coat of the new material on the pipe as it passes. Coating drys enough to handle in 12 to 15 minutes.

manually into an electric heater which keeps them separate but raises temperature of each to 120° F. A separate pump then forces each fluid into a mixing chamber, from which a single combined stream goes out to the spray heads. Compressed air atomizes the fluid and carries it onto the pipe.

While feeling their way through the first runs with the new equipment, the men on the job suffered through two or three "freezeups." Spray equipment was shut down and, before it was started again, the coating had set up. To prevent this, Price tied solvent lines into the spray equipment.

Now, when the spray shuts down for more than 2 or 3 minutes, solvent is pumped through the mixing chamber and the lines to the spray heads. The solvent flushes out the coating fluid and prevents its setting up inside the equipment.

The compressed air also caused trouble. When atmospheric humidity is high, water droplets come over from the compressor and are blown out the spray heads. This causes a "dimple" effect on the coating. Plans call for putting a dehumidifier on the compressed air line to eliminate this trouble.

Except for the compressed air problem, light rains have not interfered with coating; actual spraying is done under a shed.

Is it tough? . . . To test the new coating, Transco and Price men wrapped a bare steel cable around a joint of coated 16-in. pipe. They then hoisted the joint into the air with the cable. When the cable was removed and the dust wiped away, it was difficult to tell where the cable had been.

You can cut the coating with a blow from a sharp metal object. However, the coating surrounding the cut does not chip away. Any number of heavy blows from a board will do no

more than take off the surface gloss; they will not harm the coating itself.

Early in the work at Tilden, a freshly coated joint was laid on 2 by 6 sills. The coating was still wet and bonded to the sills as well as the pipe. About an hour later, the joint of pipe had to be pried loose from the sills. When it came loose, chunks of wood were torn out of the sills, showing the strength of the coating and its bond.

Almost all holidays can be detected with the naked eye. They are the result of "scabs" on the surface, and there are several on each joint of the large-diameter pipe.

Coating specifications are for a minimum thickness of 8 mils, but with a 3-mil anchor pattern, total thickness has been running 11 to 12 mils.

Scabs are produced on the pipe during manufacture at the rolling mill, and they can hide serious defects. As a result, each scab is ground out and inspected as a matter of routine, regardless of the coating used.

The ground-out spots, roller marks, and other holidays are patched by a coating of Arocoat applied with a paint brush. The same method will be used to coat the weld area between joints in the field.

Toting up . . . Several factors are being considered in looking at the over-all cost of laying pipe with the new coating. They include:

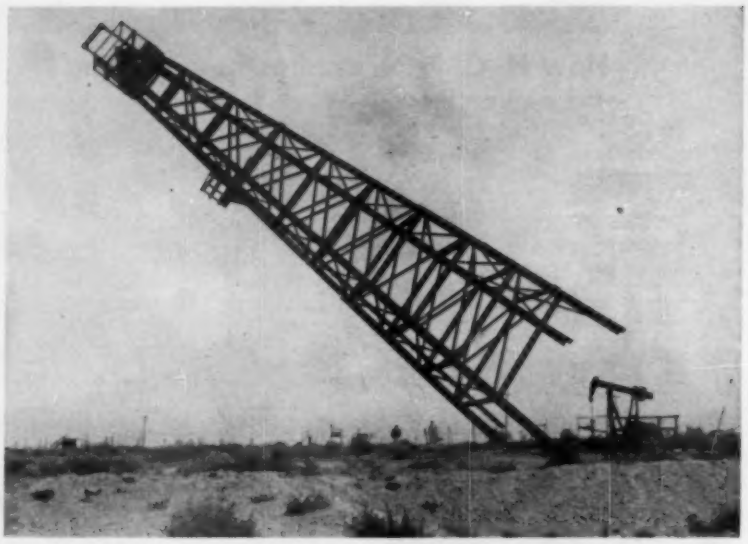
1. Cost of applying the coating, itself.
2. The difference in cost of laying the coated pipe and in laying bare pipe.
3. How well the coating survives the rigors of the laying operation.
4. Cost of cathodic protection of the coated line in the ground.
5. How well the coating lasts in the ground.

In the future the epoxy-coal-tar-resin coating is expected to cost about the same as a minimum asphalt coating. This is less than the cost of most other coatings.

Because of the coating's toughness, it is anticipated that pipe coated with it can be laid with very little more care than is used with bare pipe. This can mean a big saving. Coatings often add as much as 20 per cent to the cost of laying a large-diameter line.

Too, the new coating should come through without being chipped, crushed, or cracked. Because of this and because holidays represent only a small area of exposed metal, cathodic-protection cost should be low.

And, there's every indication that the epoxy-coal-tar-resin coating will not deteriorate in the ground.



A 41-year-old relic topples in California's Lost Hills as . . .

Wood Derricks Yield to Time

SIXTEEN wooden derricks, landmarks of the oil industry's lusty past, are being yanked to the ground by a housekeeping crew of General Petroleum Corp.

The ancient structures must go because, at their age, dry rot can set in.

The wells over which they stand in the Lost Hills lease of San Joaquin Valley have produced almost 3 million barrels of oil since the first was drilled in 1914. Today they produce, by jacklines, a total of 63 bbl. per day.

The demolition crewmen first snip the guy lines, saw off the ladder, and knock the legs loose. Then they connect a wire from the 86-ft. derrick to a truck winch for the final pull-down. The derrick legs, during the fall, lift over the jackline, and production never ceases.

New Subsidence Plan Offered

. . . by Long Beach to state legislators. City retreats from its original stand. Operators oppose compulsory feature.

LONG BEACH officials submitted a plan last week giving the state oil and gas supervisor authority if needed, to order unitization and repressuring in the Wilmington oil field to halt subsidence in the Long Beach area.

Copies of a proposed 20-page legislative act were handed members of the State Assembly interim committee on subsidence legislation. The committee conducted a 2-day hearing in Long Beach.

The recommended law would:

. . . **Give the state** oil and gas supervisor power to unitize and require repressuring in any field where land sinkage is causing damage.

. . . **Invoke the compulsory** provisions only after voluntary unitization efforts had failed.

. . . **Finance state-ordered** unitization and repressuring with a production tax on oil and gas rather than a local property tax.

The recommendations represent a switch from Long Beach's former position of favoring creation of a subsidence abatement district for the Wilmington field. The city had sought the district plan because it would give more local control over repressuring programs. But officials changed their minds when a number of legislators warned the plan probably would fail to pass the state assembly and senate.

Long Beach is asking for an emergency session of the legislature early next year to consider the subsidence problem.

Operator opposition . . . At the hearings last week, the compulsory unitization features of the bill proposed

by Long Beach drew fire from some of the major company operators in the Wilmington field.

Spokesmen for Union Pacific Railroad and General Petroleum Corp. argued that unitization should be achieved strictly on a voluntary basis.

P. S. Magruder, executive vice president of General Petroleum, testified: "It is our conviction that repressuring operations in the Wilmington field can be dealt with most effectively through voluntary action. I believe I reflect the attitude of the overwhelming majority of operators."

Another warning . . . Long Beach, already in possession of a mountain of testimony that the worst subsidence is yet to come, received still another expert warning last week.

D. R. McChord & Associates, Dallas, said in a 58-page report made for Richfield Oil Corp. that only 25 per cent of the maximum volume of subsidence has taken place to date. Unless repressuring is started quickly, subsidence in downtown Long Beach could reach as much as 22 ft.

Like its expert predecessors, the McChord report recommended a 1,000,000-bbl.-daily flood as the only way to halt subsidence. Such a flood would stop all preventable subsidence in about 3½ years. In addition to halting subsidence, a flood of that size probably would pay for itself in increased production, the report added.

Ashland Joins in Tri-State Cut

. . . of crude prices. Sohio leads the way with $3 posting, down 15 cents. Carter objects, may cancel its contract.

A CRUDE PRICE CUT of 15 cents in the Tri-State area of Illinois, Indiana, and Kentucky was taking hold last week.

Ashland Oil & Refining Co., second largest buyer in the area, followed Sohio Petroleum Co., the leading buyer, in posting a $3 price for the Tri-State area. Ashland's posting also affects eastern Kentucky crude.

Other buyers are studying the move of the two leaders. Some smaller buyers will pay the lower figure automatically because they traditionally meet the Sohio and Ashland prices rather than post their own.

The Ashland posting was effective December 13 and Sohio's December 10.

Ashland explained the cut this way: "Current realizations for the products refined from a barrel of crude oil are lower than a year ago, which was prior to the general crude oil price advances last January of 25 cents per barrel or more. The lower prices for products prevailing at this time reflect competitive conditions which result from excessive supplies of crude oil and products."

Reaction from one leading Tri-State producer to the price cut was swift. Carter Oil Co. filed a protest with Sohio and said the cut was unjustified. Carter's contract with Sohio allows it to cancel out on 15 days' notice. If company can sell elsewhere at $3.15 per barrel it may make the switch.

Carter President John W. Brice contended the 12,500 bbl. daily sold to Sohio is worth the $3.15 price, or more, particularly in view of rising production costs.

Sohio contends the cut is justified because "product prices are bad, and they are going to get worse."

"The refiner," a Sohio official said, "has been caught in the middle. He has been forced to absorb the increase in cost of raw materials."

Sohio's crude production amounts to only 25 per cent of its refinery requirements. It buys about 80,000 bbl. of the Tri-State area's daily output of about 314,000 bbl.

The Texas Co., a Tri-State buyer and producer, made no move last week to post a lower price. Texas buys about 33,000 bbl. daily and produces about 20,000 bbl. in the area.

NLRB Blocks Union Efforts

REFINERY WORKERS at the Standard Oil Co. (Ind.) plant in Casper, Wyo., will have to wait until 1959 to join the powerful Oil, Chemical, and Atomic Workers International Union.

Miffed because they received only a 5 per cent wage increase this year, the 600 workers have asked to be represented by OCAW rather than Central States Petroleum Union. But the National Labor Relations Board rejected the workers' petition because it was filed 2½ hours too late.

B. J. Rickey, union director, said nothing more can be done until the firm's present contract with CSPU expires sometime in 1959.

Rickey said the Casper workers were among "the very few" forced to settle for a 5 per cent increase rather than the 6 per cent granted OCAW.

Florida Line Upheld

by appeals court. Work to begin sometime this winter.

THE LONG-DELAYED Texas-to-Florida pipeline proposal was out of court and back on Wall Street last week.

By a 2-1 decision the Circuit Court of Appeals in Washington upheld the Federal Power Commission ruling authorizing construction of the line.

Barring further delays in court, Coastal Transmission Corp. and Houston Texas Gas & Oil Corp. are expected to start construction before spring. The line will move natural gas from Texas and Louisiana fields to residential and industrial markets in Florida.

The FPC approved the joint project last March. Its ruling was contested in court by the Florida Economic Council, which questioned validity of the FPC certificates.

Following the court decision, the pipeline companies immediately resumed arrangements for financing the line.

What's involved . . . The main transmission system will extend 1,517 miles from a point near McAllen, Tex., to the Miami, Fla., area. It will be a 24-in. line and initially will move about 250,000,000 cu. ft. of gas daily.

Coastal's portion of the line will extend 574 miles from South Texas to the Mississippi River near Baton Rouge. The company also plans 414 miles of supply laterals to gather gas from 42 fields in Texas and Louisiana.

Houston Texas Gas & Oil will build remainder of the project, including 943 miles of 24-in. main line and 682 miles of distribution laterals.

Burke County Gets Another

THE seventh wildcat to find oil this year in Burke County, North Dakota, has been brought in 7 miles north of Lignite, focal point of the Midale-Mississippian success.

The well is the 1 Ballantine of Petroleum Corp. of America and Tom Jordan, Jr. It flowed 104 bbl. of oil on a 9½-hour test of the Mississippian at 5,881-86 ft.

In addition to the seven discoveries, 21 development wells have been completed in the area during 1957. The Burke county record is the exploratory highlight of the year in North Dakota. In the Williston basin it is second in importance only to the Outlook discovery in northeastern Montana.

Lease Ban Is Delayed

. . . when O'Mahoney objects at wildlife hearing. Senate subcommittee will probe. Pro-and-con arguments given.

INTERIOR Department's plan to ban oil and gas leasing on wildlife lands has been stalled, pending a Congressional investigation.

Sen. Joseph C. O'Mahoney of Wyoming issued a sharp warning against hasty action at the opening of hearings last week on regulations proposed by Interior Sec. Fred A. Seaton last October (OGJ, Oct. 7, p. 116).

Two assistant secretaries, Ross L. Leffler for fish and wildlife and Roger Ernst for public land management, ran the 2-day hearing. Eighteen oil spokesmen and a number of representatives of conservation interests spoke.

O'Mahoney leveled several charges against the new rules. Among them:

. . . **The critical** world situation makes this a bad time to take such action. The nation must maintain a "sure and certain" source of fuel against a possible cutting of Middle East supply.

. . . **In the Leasing Act of 1920,** Congress named certain areas, such as national parks, to be excluded from oil and gas leasing but did not include wildlife refuges or game ranges.

. . . **A proposed requirement** that all leases be awarded on competitive bids is contrary to the congressional policy of encouraging exploration by granting noncompetitive leases.

O'Mahoney reminded the department that he is chairman of a Senate public lands subcommittee which is interested in developing the federal lands.

A probe of refuge leasing will start as soon as enough members of the subcommittee return to Washington.

Seaton said he would want to talk with O'Mahoney before taking final action on the new rules. Seaton said O'Mahoney is an old friend, and he also would seek the senator's views as a matter of courtesy.

The secretary said, however, he does not agree that the department is without authority to withhold refuge lands from leasing. The department's solicitor thinks it does have such authority.

"If there is no authority," he admitted, "we would have to go to Congress to get it."

Since Congress opens its 1958 session in 3 weeks, observers expect that Seaton will take no quick action which might raise the ire of the O'Mahoney subcommittee.

Oil's position . . . Industry witnesses took the position that if there is a conflict between industrial use of the refuges and protection of wildlife it should be settled in favor of oil development.

Most of the refuge areas are high lands on which little oil is found, Wyoming Gov. Milward Simpson, chairman of the Interstate Oil Compact Commission, pointed out.

Oil cannot be moved but game can, Simpson said.

The position of the IOCC was outlined by Warwick M. Downing, chairman of the IOCC public lands committee whose report on wildlife leasing was adopted by the commission at its annual meeting in Tulsa December 4.

Downing, who also is chairman of the Colorado Conservation Commission, pointed out that wildlife lands were not excluded from development under the Leasing Act. That raises a legal question whether the secretary can adopt what in effect is legislative policy by issuing new regulations.

At least two Canadian provinces, Alberta and Saskatchewan, permit multiple leasing, Downing said.

Rule plan . . . Downing joined with several industry speakers who urged creation of a committee of government, conservation, and oil interests to work out rules that would permit leasing while safeguarding wildlife.

The IOCC, in its report, urged that no public domain be set aside for wildlife purposes unless the U. S. Geological Survey first reports it is not potential oil or gas land. On the other hand, leases shou'd not be granted unless the survey reports the probable presence of oil or gas reserves.

A large number of western organizations warned that the industry would be hampered seriously in supplying defense needs if the wildlife lands are not left open to leasing.

Spokesmen for the Western Oil and Gas Association testified also that, far from hindering wildlife development, oil operations in some areas have aided the animals.

Fred W. Bush of Union Oil Co. of California, speaking for the association, proposed a three-point program for protecting wildlife in oil and gas development areas:

. . . **The Department** of Interior should pinpoint specific dangers involved in specific areas and then regulations should be drawn to cover those dangers.

. . . **All regulations** and restrictions should be prepared by a committee composed of oil men, Fish and Wildlife Service representatives, wildlife conservation groups, the Bureau of Land Management, and the U. S. Geological Survey.

. . . **The oil industry** should develop and apply operating techniques that would protect fish and wildlife in game preserves.

Kenai wildlife . . . Gordon Goodwin, Richfield Oil Corp., also spoke for the Western Oil and Gas Association. He

JOSEPH C. O'MAHONEY
. . . the senator will be consulted.

WARWICK DOWNING
. . . the wildlife will be protected.

pointed to operations on the Kenai Moose Range in Alaska as a case in point that wildlife protection and oil operations can be compatible.

"As a matter of fact, we found that by building roads and clearing some of the forest area there we made it easier for moose to move from area to area to find food. We also provided additional browse for them from the young trees which grew in and around our cleared areas," Goodwin said.

Goodwin said that even if the Kenai Peninsula reaches the productive capacity of the San Joaquin Valley only 700 of some 1.5 million acres in the Kenai Moose Range would be required for permanent oil and gas use.

California State Sen. Swift Berry, former forest service employe, told the hearing that natural-gas operators actually had improved hunting conditions in Butte County, California, by building roads to formerly inaccessible areas.

The opposing view . . . Conservationists attending the hearing said the proposed rules don't go as far as they would like but still are satisfactory.

They charged that a "few political and business leaders" are clamoring for the Government to step aside "so that an unlimited and unimpeded follow up can be made to the recent strike of oil in the Kenai National Moose Range."

Many of the big oil companies operating on refuge lands have done everything possible to prevent such damage, it was admitted by C. R. Gutermuth, vice president of the Wildlife Management Institute. But others have not, he charged.

"There always will be less reliable 'wildlife operators,' and even under the best of conditions oil and gas operations pose the constant threat of impairing and rendering large expanses of wildlife refuge lands valueless," Gutermuth asserted.

Bisti Spacing Issue Revived

Eighty-acre spacing for Bisti field will be examined again December 18 at a hearing conducted by the New Mexico Oil Conservation Commission.

The commission rejected an earlier application for 80-acre spacing, leaving the pool under the state-wide 40-acre spacing rules.

The new hearing was requested by major operators in the field who contend that Bisti's reserves can be developed adequately with 80-acre spacing and that 40-acre spacing would be uneconomical.

Average depth in the field is slightly more than 5,000 ft.

Pipeline briefs

Wilshire Oil Co. of California was nearing completion of a 21-mile, 12-in. crude line from its marine terminal at Huntington Beach to its Norwalk refinery. The line also will be used to unload cargoes for other refiners in the Los Angeles Basin. The line is capable of handling the largest supertankers. By reversing the flow, Wilshire plans to pump fuel oil from the refinery to the marine terminal making it the only deepwater bunkering facility on the Pacific Coast.

Forest Oil Corp., Denver, will complete its 35-mile, 8-in. line from Grieve Unit field in Wyoming to the Platte Pipe Line near Casper the middle of next month. Sterling Construction Co., Sterling, Colo., started work November 7. Capacity of the line will be 5,000 to 10,000 bbl. daily. The line will be operated at high pressure to prevent the high pour-point crude from solidifying.

Pasotex Pipe Line Co., crude-oil pipeline subsidiary of Standard Oil Co. of California, has replaced its dual 8-in. system from Wink, Tex., to El Paso with 20-in. pipe. Capacity was increased from 57,000 to 94,000 bbl. per day. Ultimate capacity will be 220,000 bbl. per day.

T. S. Petersen, Socal president, said the expansion should help the long-term markets for West Texas crude by permitting El Paso refineries to supply more of Arizona's needs.

Southern Pacific Pipe Lines, Inc., now moves products from El Paso to Phoenix and from Los Angeles to Phoenix through its 20,000-bbl. daily line. Petersen again raised the possibility of reversing the Southern Pacific line on the west section and converting it to crude in case a national emergency should reduce California's foreign oil supply. Southern Pacific capacity could be doubled quickly. This has been used as an argument against a government-backed line from West Texas to California.

The Overisel gas field in Allegan County, Michigan, has been sold at a record Michigan price of $17.2 million. Taggart Co., Big Rapids, Mich., made the sale to Michigan Gas Storage, affiliate of Consumers Power Co.

Michigan Gas is building a 40-mile, 12-in. line from the field to Kalamazoo and will spend another $3.5 million for pipelines and a system to gather the estimated 50 billion cubic feet of gas reserves in the 6,000-acre field. Taggert has developed 38 gas wells in the 2,700-2,800-ft. Salina zone. Eventually, Michigan Gas plans to convert the field into a storage reservoir.

El Paso Natural Gas Co. plans to increase its take by 20,500 M.c.f. daily from two gasoline plants in Crane County, Texas, and Lea County, New Mexico. El Paso has temporary FPC authority to spend $2,427,000 to install added purification and dehydration facilities and 4,050 hp. in compression at its McElroy-Crane plant. It would increase purchases from Phillips Petroleum Co. by 16,500 M.c.f. daily. El Paso will take an additional 4,000 M.c.f. from Cabot Carbon's King plant in New Mexico.

Atlantic Seaboard Corp., subsidiary of Columbia Gas System, completed two compressor stations which will permit increased deliveries this winter. Another station is being built. Dravo Corp. constructed the 2,000-hp. units at Cleveland and Files Creek compressor stations. Atlantic Seaboard, headquartered at Charleston, W. Va. has awarded a contract to J. F. Pritchard & Co. for a 4,000-hp. unit at Boldman station, to be completed by April 1.

Also for Pipeliners . . .

IN THE NEWS: Prospect of pipeline connections one of factors piercing present gloom among offshore operators (p. 64) . . . First pipeline built for interstate movement of ethylene ready (p. 68) . . . New sprayed-on plastic gives tough outer coating for pipelines (p. 70) . . . Conversion of Little Inch comes before FPC for third time next week (p. 77) . . . Arbiters will settle $100-million dispute over Tapline profits between Aramco and Saudi Arabia (p. 78) . . . Trans-Iran products pipeline will be ready in 1958 (p. 79).

PLUS THESE TECHNICAL REPORTS: Automation scores in double jointing (p. 82) . . . New pipeline ideas for gathering-system construcion (p. 134).

Gravity vs. Value

. . . as the best way to price crude again discussed; profit can vary 20 cents a barrel for same gravity, chemists told.

THE TIME-HONORED method of pricing crude oils increasingly is coming under attack by refiners.

Latest to question use of API gravity as the sole criterion of a crude's value were two speakers at the Southwest regional meeting of the American Chemical Society in Tulsa.

N. R. Adams and R. C. Kersten of Universal Oil Products Co. declared a more realistic method of assigning practical values to crude oil now is needed. They contended the basis should be the amount of certain hydrocarbon fractions contained in the oil regardless of its origin or gravity.

The Adams-Kersten evaluation would be based on four basic fractions in the oil: Virgin gasoline I.B.P.-350° F.) middle distillate (350°-650° F)., heavy distillate (650°-1,050° F.), and residue (above 1,050° F.).

The method also would take into consideration the sulfur content and availability of hydrogen for desulfurizing the virgin and cracked naphthas by hydrogen treating.

Case in point . . . Interesting feature of the Adams-Kersten study was a comparison of Middle East and Venezuelan crude of nearly the same gravity and the different profits a refiner could realize from them.

For the sake of the study, Adams and Kersten put the crudes through a hypothetical modern refinery. Processing consisted of crude and vacuum distillation, fluid catalytic cracking, Unifining-Platforming, catalytic polymerization, HF alkylation, distillate Unifining.

The two crudes selected (small table) were similar only in their API gravity. However, the differences in percentage of basic fractions weren't too great.

But the differences in value were startling when the crudes were put through the refinery (large table). This economic data—exclusive of depreciation, interest, and income taxes—indicated that refinery net operating profits may vary as much as 20 cents per barrel of charge.

This difference pyramids fast. It would amount to a $1,800,000 annual gain or loss in a refinery having an average daily throughput of 25,000 bbl.

Tricks in processing . . . In making their study, Adams and Kersten noted that proper selection of processes also affects refining earnings markedly.

For example, one crude may have more residuum in the 1,050° F.+ range than another of equivalent API gravity. An increase in refinery earnings may be obtained by coking the heavy-crude residue.

Thus, in the case of the Middle East crude, a refiner might nearly double net operating profit in a 25,000-bbl. plant by adding coking and sulfur production. Coking the crude residue would give the bulk of the increased earnings since addition of the sulfur plant would add to profits only in a minor way.

Presence of sulfur and availability of hydrogen in the crude also will affect refining values of the oil. The effect of certain types of sulfur compounds as TEL susceptibility is now well known. It is interesting to note what this means at high-octane levels.

The speakers reported that data from Ethyl Corp. indicates that as little as 0.05 per cent by weight of thiophenic sulfur in a 105-octane gasoline will cause loss of as much as two octane numbers at 3 ml. TEL per gallon. This points up the importance of hydrogen treating in obtaining gasoline quality.

This makes hydrogen availability closely allied to the sulfur problem. Luckily this situation prevails:

Hydrogen production by Platforming or other catalytic reforming processes increases rapidly with API gravity crude.

Sulfur content of basic fractions increases also with crude gravity. But volumes of naphtha and distillate to be desulfurized decrease substantially as crude gravity decreases.

Same gravity gives different yields . . .

Crude Properties	Middle East	Venezuela
Gravity	31.2	31.2
Sulfur, weight per cent	2.0	1.48
Basic Fractions (Volume Per Cent)		
0°-225° F.	10.5	9.2
225°-350° F.	14.0	11.0
Paraffins	60	55
Naphthenes	28	31
Aromatics	12	14
350°-650° F.	25.5	33.7
650°-1,050° F.	27.5	28.8
1,050° F. (residue)	22.5	17.3

. . . And a different profit picture, too

		Middle East		Venezuela	
	$/bbl.	Yield, vol. %	$/bbl.	Yield, vol. %	$/bbl.
Value of products*—					
Gasoline†	6.55/5.55	48.8	2.92	51.8	3.13
Fuel gas	2.93 (FOE)	4.0	0.12	3.9	0.11
C_3 LPG‡	4.10	3.4	0.14	3.2	0.13
C_4 LPG‡	4.52	0.5	0.02	.....	.....
No. 1 fuel oil	4.53	9.7	0.44	13.8	0.63
No. 2 fuel oil	4.38	.....	.....	3.5	0.15
No. 6 fuel oil	2.93	32.9	0.96	24.7	0.72
Total	.....	.....	4.60	.....	4.87
Less 1 % handling loss	.....	.....	0.05	.....	0.05
Total value products	.....	.....	4.55	.....	4.82
Cost of Charge Stocks—					
Crude oil	3.00	100.0	3.00	100.0	3.00
Purchased butane	4.52	0.1	0.01	1.3	0.06
Gross profit	.....	.....	**1.54**	.....	**1.76**
Operating expenses	.....	.....	**0.81**	.....	**0.82**
Net operating profit	.....	.....	**0.73**	.....	**0.94**

*Price structure "typical" of Eastern Seaboard. Basis is 0.5 cent per gallon over Platt's Gulf Coast low weighted-average prices for the first half of 1957 for all products except propane and butane. †Premium gasoline of 102 octane number valued at 2.5 cents per gallon—over 95 octane Gulf Coast price. ‡For propane, New York Harbor tank-car prices were used in which butane was valued at 1 cent per gallon over propane prices.

Little Inch Case

sent to examiner for prompt action. FPC hearing set.

CONVERSION of Texas Eastern Transmission Corp.'s "Little Inch" pipeline from gas to products will come up before the Federal Power Commission December 23 for the third time.

The FPC, under court order, sent the case back to an examiner last week. So that the long-pending case is not further delayed, the FPC instructed the examiner to hold hearings and submit his report promptly.

The switch of the pipeline back to the product service for which it originally was built during World War II was first approved by the FPC in June 1955.

Barge interests which would feel the competition of the line protested that they had not been given a chance to present their side of the case. The District of Columbia appeals court agreed and sent Texas Eastern's application back to the commission with orders to hear the protestants.

The FPC, after further hearings, again approved the conversion last June 21. But the barge interests protested again, arguing that the order was invalid because the commission had bypassed the examiner's report normally required in such cases. Again the court agreed, and ordered th FPC to go through all the formalities required by law. Texas Eastern has completed all construction necessary for the conversion and is only awaiting final FPC approval before starting products through the line.

Texas Refinery Expanding

AMERICAN PETROFINA Co. of Texas has let contract for construction of new Platforming and alkylation facilities at its 20,000-bbl. Mount Pleasant, Tex., refinery. The contractor, J. F. Pritchard & Co., Kansas City, Mo., is expected to complete the job in 10 months.

The U.O.P. Platformer, rated at 3,000 bbl., and the HF alkylation unit, rated at 1,500 bbl., will cost roughly $2 million. The alkylation unit will be used solely to upgrade motor fuel rather than supply aviation gasoline.

With the alkylation unit the refinery can handle a wide range of feed stock, such as propylene, butylene, amylene, and isobutane. The plant also will have a highly flexible octane position, according to D. R. Zachry, executive vice president of the company.

Processing briefs

Union Carbide Corp. is getting out of the polyester resin business. Its Bakelite Division feels that the future of reinforced plastics lies largely outside polyesters, but will continue to promote epoxy and phenolic resins for this field. The present market for polyester resins is estimated at 100,000,000 lb. per year, supplied by 30 or more producers.

Anderson-Prichard Oil Corp. will build a 2,500-bbl. HF alkylation unit at its 25,000-bbl. Arkansas City, Kans., refinery. The unit, licensed by Universal Oil Products Co., will be completed in the third quarter of 1958. Refinery Engineering Co. has the contract for the unit.

A 22,500-bbl. daily Houdriformer will go on stream next March at Tidewater Oil Co.'s Avon refinery on San Francisco Bay. The unit is designed so that capacity can be doubled. Tidewater also plans to complete next year a coke-burning boiler, designed to use 170,000 tons of coke annually. Coke will be supplied by a 42,000-bbl. fluid coking unit built last year at Avon.

The nation's first survey of lubricating-grease production will be taken by the National Lubricating Grease Institute beginning in January. Results will be ready for release about midyear. Most of the members of the institute, which represents over 95 per cent of the lubricating-grease industry, have agreed to participate in the project. The survey will be based on 1957 production figures.

Esso Standard Oil Co. has refitted two 27,000-ton tankers to handle lube-oil stocks together with crude. Lubes will be loaded in special compartments equipped with segregated pumping systems and special hot-air drying facilities to remove all moisture before loading. The Esso "Huntington" and "Bangor' will each carry 50,000 bbl. of lubes for Bayonne and 150,000 bbl. of crude for Bayway on each coastwise trip from Baton Rouge. A pier at Bayonne has been revamped to receive the lubes.

Du Pont has reduced the price of tetraethyl lead approximately 1 cent, meeting a price reduction announced by Ethyl Corp. Both cuts were effective December 4. On the basis of equivalent TEL content, the new Du-Pont prices are 60.18 cents per pound for motor mix, 61.18 cents for motor mix A and 66.08 cents for aviation mix.

Pacific Petroleums, Ltd., will build a 3,000-bbl. asphalt plant at Dawson Creek, B. C., junction town for the Alaska and John Hart highways. The plant, which will cost about $500,000, is scheduled for completion by next May. Site for the new plant is near the 3,000-bbl. refinery owned by X-L Refineries, Ltd.

Imperial Oil, Ltd., will boost capacity to 32,100 bbl. daily at its 25,000-bbl. refinery at Ioco, B. C. The $2,250,000 expansion project will include a depropanizer, atmospheric furnace, stove-oil treater, new drying facilities for middle distillates, and two 96,000-bbl. storage tanks. Canadian Bechtel, Ltd., will handle most of the construction.

National Cooperative Refinery Association plans to expand and modernize it 28,500-bbl. McPherson, Kans., refinery. Refinery Engineering Co. has a contract to revamp the crude, coking, and alkylation units. Added throughput expected as result of the program was not an nounced by the cooperative. The work will be completed late in 1958.

An agricultural chemical plant will be built at Simcoe, Ont., by Shell Oil Co. of Canada, Ltd. Costing about $60,000, it will make granular and regular dusts, wettable powders, and seed dressings. It is slated for completion in 1958.

Also for Refiners . . .

IN THE NEWS: Two fires cripple New Orleans refinery (p. 67) . . . API gravity as basis for pricing crude oil under attack again. Researchers offer new method based on refining value of crude (p. 76) . . . International Petroleum puts new Cartagena Bay refinery on stream in Colombia (p. 79) . . . Indonesia trouble casts uneasy shadow over big new refinery investment in country (p. 80) . . . Site for Indian refinery finally approved (p. 81) . . . Stanvac gets permit for Philippines refinery (p. 81).

PLUS THESE TECHNICAL REPORTS: How to control static electricity in commercial tankage (p. 89) . . . Feed preparation and finishing of butadiene (p. 110).

San Jacinto Well Has Big Flow

. . . on eastern Maracaibo tract west of Ceuta discovery. More drilling is planned by seven-company combine.

A FOURTH group of newcomers to Lake Maracaibo has brought in a flush well on new and expensive acreage.

San Jacinto Petroleum Corp. and six partners report a flow of 5,760 bbl. of oil per day from their first test on a 1,967-acre national reserve tract in the lake's eastern section.

The well, Marlago 1, flowed 27.1°-gravity oil through a ¾-in. choke. Tubing pressure was 900 psi., and production is from perforations in the lower Miocene at 11,240-96 ft. Scouting reports indicate the well is now at 13,026 ft. or deeper but that it had encountered 125 ft. of oil sands by the time it reached 11,444 ft.

The discovery is 2¼ miles west and slightly south of last year's spectacular blowout, the Ceuta discovery of Mene Grande Oil Co. A 24-mile, 16-in. pipeline is now taking crude from Ceuta.

Both the Marlago and Ceuta discoveries lie on subdivisions on national reserve block V-575. The San Jacinto tract lies in the northwest corner of the block. Mene Grande has held acreage to the east and south for years. It also has a new 32,059-acre block on the west, obtained for $996.50 per acre last year.

Venezuelan Leaseholds originally won the San Jacinto tract with a bid of $1,964 per acre. San Jacinto bought into the concession in October, 1956, and since then the company and six other independents have acquired all the interest.

San Jacinto, the operator, has 30 per cent; Tennessee Gas Transmission Co., Murphy Corp., Union Oil & Gas Corp. of Louisiana, and Lion Oil Co. division of Monsanto Chemical Co., each 15 per cent; Sharples Oil Corp., 6 per cent; and American Petrofina, Inc., 4 per cent.

The group now has two rigs in use on the concession, and foundations have been built for drilling four additional wells.

Two other newcomer groups have made discoveries within recent weeks at Maracaibo. Sun, Atlantic, and Seaboard have a 7,080 bbl. daily well on Block 1. Signal, Hancock, Sohio, and Pure have a 2,400 bbl. daily well on Block 4.

Superior Oil Co. was the first newcomer to hit. It has two flush wells on a national reserve block in the center of the lake (OGJ, Dec. 9, p. 87).

San Jacinto, in addition to its V-575 interest, has a 25 per cent interest in Block 10 to the west. Phillips Petroleum Co. is the operator and principal owner. First test in Block 10 is drilling at about 10,500 ft.

Arbiters to Settle

row over Tapline profits between Aramco, Saudis

ARABIAN AMERICAN OIL CO. and Saudi Arabia have agreed to arbitrate a long-standing dispute over $100 million in back pipeline revenues.

The disagreement arose over the basic issue of where to make the 50-50 profit split in the country's oil operations.

The government claims $100 million is due from the operation of Saudi Arabia's 315-mile section of the 1,069-mile Trans-Arabian pipeline system. The amount covers the share of income the Saudis feel should be theirs in the period from the line's opening in 1950 through 1956.

The way Shaikh Abdullah Tariki, Saudi Arabia's director general of oil, looks at it, his government is entitled to half the pipeline income.

He sees the problem this way. The posted price for crude at Tapline's Sidon terminal is $2.59 per barrel. The posted price at Ras Tanura, on the Persian Gulf, is $2.12 per barrel. This leaves a difference in posted prices of 47 cents.

Aramco now pays Trans-Arabian Pipe Line Co. 21 cents per barrel for carrying the crude the final 754 miles to Sidon. Aramco keeps the remaining 26 cents. The Saudis have insisted for years that they are entitled to half the revenue kept by Aramco. They argue the 50-50 split in profits should be made at the point of delivery to Tapline.

The company has not paid the Saudis on this basis. It contends the revenues from pipeline operations are not a part of the profit on crude sales, on which the 50-50 division is made.

Indiana Makes Algerian Bid

STANDARD OIL CO. (Ind.) which started to move into foreign oil play when it entered Latin America 2 years ago is now trying to take the big step into the Eastern Hemisphere.

A subsidiary, Pan American Petroleum Corp., is one of the American companies seeking a concession in Algeria. It is bidding for a slice of a 23,000 sq. mile area in the Sahara Desert opened to newcomers.

Other companies in the running include Canadian Delhi Oil, Ltd.,

Sinclair Oil Corp., Newmont Mining Co., Cities Service Co., and Phillips Petroleum Co.

Foreign bidders include subsidiaries of British Petroleum Co., Ltd., and Royal Dutch-Shell. At least 50 per cent French participation is required in all offers.

Trans-Iran Pipeline

will be ready in 1958 when old crude line is replaced.

FINAL PHASE of National Iranian Oil Co.'s 785-mile trans-Iranian products pipeline will be completed next year.

NIOC has contracted with Entrepose Co., French constructors, to lay 90 miles of 12-in. from the Abadan refinery on the Persian Gulf to Ahwaz, the origin point of the new line which terminates at Teheran. Pipe deliveries are scheduled to start next month. Construction will begin in the spring.

This project involves replacement of an old crude line which has comprised the southern leg of the system. The pipe is in bad condition, unable to withstand high pressures, and has been causing trouble with filtering.

NIOC plans to add seven more pump stations during 1959 and 1960. Ultimate capacity is 2 million tons of products per year.

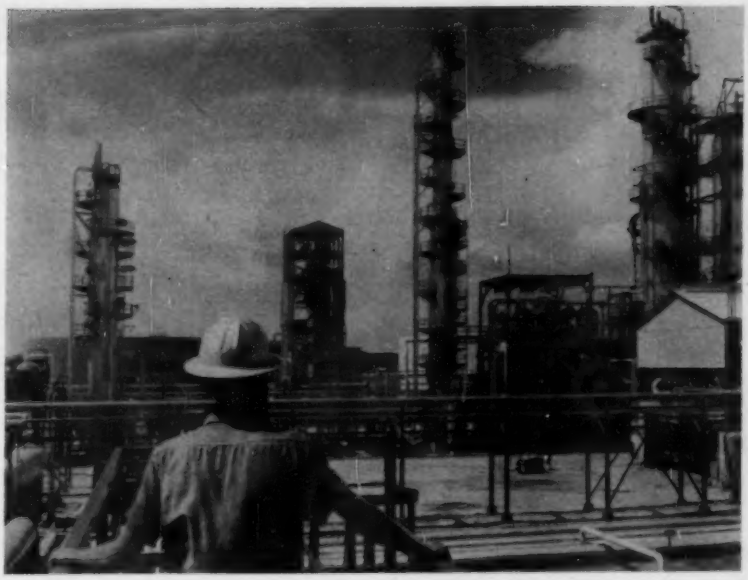
Entrepose laid 396 miles of 10 and 6-in. line on the northern and eastern sections of the line. The eastern leg, 160 miles of 6-in. from Azna to Isfahan, was completed this fall. Williams Brothers Co. and Costain-John Brown, Ltd., laid the 299-mile, 10-in. section north from Ahwaz last year.

Bolivia Awards New Acreage

DRILLING & EXPLORATION Co., Inc., Dallas, has won six concessions totaling roughly 1,250,000 acres in eastern Bolivia.

The concessions were awarded by executive decree to Bolivian Petroleum Corp., a wholly owned subsidiary of Drilling & Exploration.

They lie generally in the foothills belt along the east flank of the Andes Mountains. Other U. S. firms holding concessions in the same general area include Bolivian Gulf Oil Co.; Shell Prospecting Co.; Andes Oil Co., Inc. (Pure Oil Co. and others); and Chaco Petroleum, S. A. Chaco is a combine of Tennessee Gas Transmission Co., Union Oil & Gas Corp. of Louisiana, Lion Oil Division of Monsanto Chemical Co., and Murphy Corp.



Colombian Refinery on Stream

. . . at Cartagena Bay. It makes the country self-sufficient in petroleum products and uses Magdalena Valley crude.

LATIN AMERICA'S refining capacity took a healthy jump last week when the 26,500-bbl. Cartagena Bay refinery went on stream less than 2 years after it was started.

When International Petroleum (Colombia), Ltd., started construction in January 1956, the company set a completion date of "late 1957" (OGJ, Jan. 23, 1956, p. 59). The plant went on stream last week processing Colombian crude. It was built by Cia. Bechtel, S.A., a subsidiary of Bechtel Corp., San Francisco.

The new refinery will make Colombia self-sufficient in petroleum products.

Located on the Caribbean Coast, the new plant is near the terminus of the Andian National Corp. pipeline system, which moves crude production north to tidewater from the Magdalena Valley fields of Colombia.

The new refinery has a conventional two-stage pipestill, a Model IV cat cracker complete with vapor recovery facilities, and a nonselective cat poly unit. Process specifications were prepared by Esso Research & Engineering Co., a sister subsidiary of Standard Oil Co. (N.J.).

The new plant's cat cracker has a fresh feed rate of 13,000 bbl. daily with a total feed of 25,000 bbl. daily. The unit's vapor recovery system furnishes 3,600 bbl. daily of propane, propylene, butane, and butylenes to the cat poly unit for the production of poly gasoline.

Output of the refinery, earmarked for local consumption, will be distributed by barge to the north coastal areas of Colombia, upriver to the interior by barge, and by tanker to the Pacific Coast areas of the country.

New Iraq Terminal

will help move more crude from big southern fields.

KING FAISAL told the new parliament that a terminal will be built at Umm Qasr at the mouth of Shatt al Arab River. The terminal will remove the biggest bottleneck to southern production by permitting big, modern tankers to load southern crude for the first time.

Supertankers cannot make it upriver to the present terminal at Fao. Some improvements have been made, however. Shipments from the port passed the 200,000 bbl. daily for the first time in October.

Basrah Petroleum Co., Ltd., an affiliate of Iraq Petroleum Co., Ltd., has the concession over the southern area. The company has just completed a 20-mile, 16-in. line between its two biggest fields—Rumaila and Zubair.

Basrah has also talked with Kuwait about a pipeline through that small shaikhdom to a more favorable port down the gulf.

Iraq hopes to expand crude exports from Kirkuk and other northern fields.

HANDSHAKES were in order between Stanvac's Berlin (left) and Indonesia's Inkiriwang at dedication of Southeast Asia's first fluid cat cracker. But with new anti-Dutch unrest afoot . . .

Indonesia Worries Investors

WHILE FOREIGN OIL MEN watched uneasily last week, a new $8-million, 11,400-bbl. fluid cat cracker was busy pouring out Indonesia's first high-octane gasoline components.

The new refinery unit is only one of several paradoxes involved in Indonesia's troubled political-economic picture. It's part of a multimillion-dollar investment that three oil companies have poured into Indonesia, banking not only on a stable political climate, but an improving one. Now all three companies wonder.

The Indonesians last week were trying to toss all the Dutch out of the country. One of the three oil companies operating there is N.V. de Bataafsche Petroleum Mij., a Royal Dutch-Shell company. The Shell company, like its American counterparts in Indonesia, has been investing heavily in the country. Now it's one of the targets of a concerted anti-Dutch drive.

So far the Indonesians have seized other Dutch firms and ordered Dutch nationals to leave the country. Reports from Djakarta have detailed no specific action against Shell, but it may come. Shell produces about 100,000 bbl. daily of Indonesia's crude and operates four refineries in the archipelago.

The government-sponsored anti-Dutch drive began because Indonesia is miffed at the failure of the United Nations to formally consider its claim to western New Guinea which remained in Dutch hands when Indonesia became independent.

The two American companies, Standard Vacuum Oil Co. and Caltex, have not felt the direct force of the drive, but if it hits Shell, they could be next.

New refining units . . . The three companies have a $200,000,000 spending program under way.

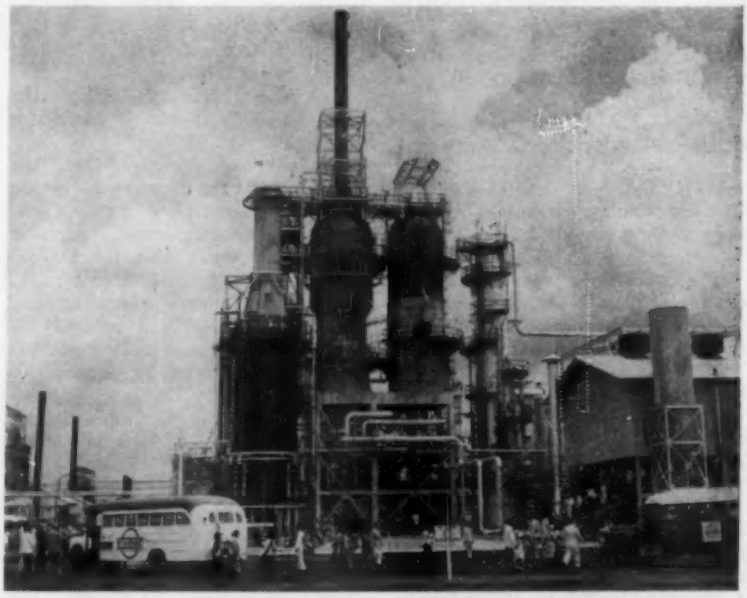
The new cat cracker at Sungei Gerong is only a part of Stanvac's $80-million expansion program.

The company poured $31 million of its program into the 31-year-old, 71,000-bbl.-daily refinery near Palembang, Sumatra. Other new units include a 4,370-bbl.-daily cat poly unit, a sulfuric acid unit, a reformer stabilizer, and other auxiliary units.

The new cracker was dedicated just a little more than a month ago by F. J. Inkiriwang, Indonesian minister of industry. It was a festive ceremony, an occasion that called for hearty handshakes and smiles from both Inkiriwang and E. W. Berlin, Stanvac's general representative.

Less than a month later—and just before the anti-Dutch campaign—Stanvac reversed its field as far as exploration is concerned. The company announced it was suspending all exploratory activity in Indonesia. The reason? The government's failure to grant new areas in which to look for oil (OGJ, Dec. 9, p. 87).

About the only bright spot involved in the murky atmosphere last week was the fact that the center of Indonesia's oil activity is in Sumatra. Most of the activity which poses a threat to the foreign oil operators seems to be centered at Djakarta, the capital, on Java. The people of Sumatra and its almost autonomous government have shown no disposition in the past to go along with some of the capital's moves.



MULTIMILLION-DOLLAR spending program by three companies includes Stanvac's new 11,400-bbl. fluid cat cracker at Sungei Gerong. Indonesia produced its first high-octane gasoline components here when the unit went on stream earlier this fall.

Austria May Open Areas

. . . to foreign operators. Raab says country needs capital and know-how of western oil companies to bolster output.

AUSTRIA, once the principal oil-producing province of western Europe, may turn to private companies again to develop the country's oil reserves.

Chancellor Julious Raab has announced the government will ask for the cooperation of foreign operators to maintain domestic production. He said the time has come to open oil concessions to western companies, but he didn't say when that would be.

In a recent radio talk, Raab emphasized the benefits of foreign participation and told his listeners the concession grants would not hurt the socialized local industry.

In fact he pointed out that Austria needs the capital and experience of private oil companies.

Refineries involved . . . His announcement came just a few days after the Austrian Government reassured companies that nationalized refineries would be turned back to their owners soon.

At least three western companies would figure in prominently if and when Austria opens the concession door again. Standard Oil Co. (N. J.), Socony Mobil Oil Co., Inc., and the Royal Dutch-Shell Group staked out the fields which until recent years made Austria the leading crude producer in western Europe.

These productive concessions were taken over by the Nazis in the late 1930's. Then the Russians took over after World War II. When Russia withdrew in 1955, the properties were turned over to the nationalized Austrian industry.

When Austria regained her independence, the government agreed to permit the old concession holders to participate in oil development again.

But the promise has been a political football. Some western diplomats wanted to keep the concession agreement private. This backfired, and the local Communist Party has hammered away at it ever since.

Raab said the country is fulfilling its state treaty obligations to Russia, and must meet certain commitments to the West. Austria must ship 20,000 bbl. of oil daily to Russia for the next 8 years.

Two companies would be involved if Austrian refineries were returned to their owners. Socony Mobil and Shell have small refineries at Kagran and Floridsdorf. The plants are operated by the companies, but the government has technical title.

The companies also jointly own an 8,800-bbl. refinery at Lobau. This plant is operated by the government.

Indian Refinery Site Approved

THE Indian Government and Burmah Oil Co., Ltd., have worked out a compromise over a refinery for Nahorkatiya crude that students of statehouse politics would well understand.

India and Burmah Oil, in 2 years of talks, settled all problems of the development of Nahorkatiya field except one—where to build a refinery. Three locations were proposed.

The government insisted on a location at Barauni, in the state of Bihar. A 600-mile crude pipeline would be needed to carry crude from Upper Assam Valley. Burmah Oil wanted to build an 850-mile line to Calcutta, where the refinery would be the most economic. The local Assam Government, with little political power or financial resources to barter with, demanded the Nahorkatiya crude be refined in Assam.

The Assam Government proposal seemed to have little hope until the national government's rival plan hit a snag. In addition, Burmah Oil was delayed so long in raising money for the project that it couldn't get the capital in tightened London money markets.

The upshot is that a 20,000-bbl. plant will be built in Assam during the next 3 years. The site remains to be selected. But the local government has proposed the town of Gauhati on the Brahmaputra River. The town is about 200 miles east of Nahorkatiya.

Burmah oil will lend the Indian government $28 million for the project. The new company to be set up will extend the line later to a larger, proposed plant at Barauni.

The potential of Nahorkatiya and nearby Hugrijan and Moran areas has been revised upward steadily. The area is now rated at 60,000 bbl. daily.

Under the company-government agreement, Burmah Oil will have two-thirds interest and India one-third in a new company to operate the fields. Assam Oil Co., Ltd., a Burmah Oil subsidiary, is currently developing the production. The government will have two-thirds and Burmah Oil one-third in a refining company.

Japanese Sign Deal

with Saudi Government for offshore concession. Kuwait role not disclosed.

THE MUCH PUBLICIZED concession deal giving the Japanese exploration rights in the Persian Gulf off the Saudi Arabia-Kuwait Neutral Zone was signed last week, but there are still some hitches.

Details of the agreement, signed by the Japanese and Saudi government representatives, have not been divulged. Persistent rumors for weeks indicate, however, that the Japanese have agreed to give Saudi Arabia at least 56 per cent of the profits and in addition build a refinery in which the Saudis would also take a profit share.

Kuwait's role . . . The big question that was still not answered last week is how Kuwait fits into the picture. Kuwait holds half the rights to the offshore area just as it does in the neutral buffer zone between the two countries.

Two companies, Getty Oil Co. and American Independent Oil Co., operate the onshore fields jointly. Getty got its half interest in the concession from Saudi Arabia and Aminol got its half from the shaikh of Kuwait. The concession includes "territorial water."

The Neutral Zone's onshore fields are now producing almost 80,000 bbl. daily.

Philippines Refinery Planned

STANDARD-VACUUM Oil Co. will build a $33,500,000 refinery on Bataan Peninsula with an initial capacity of at least 25,000 bbl. daily.

Stanvac last week received permission to build the plant from the Philippine department of agriculture and natural resources, winding up extended negotiations.

The plant will be built on a 500-acre site on the east coast of Bataan, overlooking Manila Bay. It will be completed in 1961. A new subsidiary, Standard - Vacuum Refining Corp. (Philippines), will be the operator.

GRINDER driven by 360-cycle electric motor for grinding bevel to form a thicker land. Beyond operator is self-contained power package for actuating trip mechanism on pipe rack.

FULLY AUTOMATIC submerged arc welding head which runs first two beads externally. Man in foreground is removing slag. Behind him suction hose is manipulated for removing granular flux.

Automation Scores in Double Jointing...

New technique for inside and outside welding

By Paul Reed
Pipeline Editor

AN ENTIRELY NEW type of unit has been built to take advantage of the utmost in automation which can be applied in handling, rotation, and welding of pipe during double-jointing operations. Its production rate on 30-in.-diameter pipe is 10 to 12 welds per hour.

The unit known as the Crose Price-O-Matic double jointer represents the second step—and in many ways the most important step—taken in less than a year for the development of a new completely mechanized technique for submerged-arc double-jointing of pipe.

Basic Process

Advantages of the original basic technique, known as the Price-O-Matic submerged-arc-welding process, were first demonstrated as recently as February 1957 in the Price-Poole yard operations. These were successfully continued through winter and spring months in Manitoba for the double jointing of 34-in.-diameter pipe for the Trans-Canada Pipe Lines, Ltd., system (OGJ, Apr. 22, 1957, p. 104).

The technique requires no preheating even in the coldest weather.

Basic features of the technique are: (1) Joint design having a thicker "land" at the pipe ends which are butted snugly together without spacing; (2) welding entirely with submerged arc, first by two outside beads and then with an inside bead of greater penetration.

This method departed entirely from the usual one of depending on manual electric arc welding for the first or stringer bead. Instead, the bead nearest the interior of the pipe is actually run last by the Price-O-Matic process.

Higher quality and uniformity of welding is obtained by closer control of all conditions of welding.

This pioneering operation showed that by this technique, double jointing could be done in the coldest weather at rates approaching 90 welds per day on 34-in. pipe.

Improved Equipment

This second unit has been developed to increase output 30 per cent by (1) grinding equipment to produce more uniform pipe ends having the required special thick land; (2) special comprehensive controls and faster pipe-handling equipment for line-up; and (3) completely automatic submerged-arc-welding heads which require no adjustment once the controls are set. (Previously submerged arc welding for pipelining has mostly been done with semiautomatic heads requiring frequent adjustment.)

Pipe sizes which can be handled by the new double jointer range from 22 to 36-in. diameter.

The pipe-handling equipment, the control facilities, and the portable power plant have been designed so as to speed up throughput and provide maximum flexibility. Special features make it possible to dismantle and assemble the equipment more quickly when the unit is moved from one location to another.

The unit is advantageous by contributing to greater output of a spread and thus reducing the time taken to complete a project.

Costs and Savings

How this is accomplished can be indicated by a hypothetical case: Assume that a contractor has a project for laying 75 miles (400,000 ft.) of 30-in. at a contract price of $3.50 per foot.

The double jointer operating at a series of yard locations would make half of the welds for the job (5,000 welds—one for every 80 ft. of pipe).

A pipe gang operating in the usual way in prairie country would be expected to average 200 line-ups per day with 40-ft. pipe giving a total production of 8,000 ft. per day, yielding a gross income (at $3.50 per foot) of $28,000.

Now, with double-jointed pipe in 80-ft. lengths, the production of the pipe gang (from a line-up standpoint) would be decreased 20 per cent. But the 160 line-ups with 80-ft. pipe would give a higher footage output, totaling 12,800 ft. per day producing a gross income of $44,800.

Thus the contractor's gross income would be increased by $16,800 per day, assuming that all other operations kept up with or ahead of the

WELDING OPERATOR preparing to enter 30-in. pipe on gantry boom to run the third submerged arc bead to complete the weld.

pipe gang. Even though the welds made at the double-jointing yard cost $5.00 more per weld than a field weld, the premium for double jointing would be $25,000 for the entire 75-mile job. However, this extra cost could be offset in 2 days due to increased footage

Experience has shown that the pipe gang generally sets the pace for any pipeline spread. Anything to increase pipe-gang production steps up daily production for the whole job.

Welding Rate

What output can be expected from double jointer? The new unit is rated to produce 110 welds on 34-in. pipe per 10-hour day. The maximum for the earlier unit was 85 welds per average day of the same size pipe.

Production is determined by the rate of speed required for welding the first two beads. The following data have been obtained in welding 30-in. pipe with the new double jointer:

	External		Internal
	1st pass	2nd pass	3rd pass
Welding speed in./min.	90-100	65	55
Welding amperage	750-800	800	800
Welding voltage	32	34	32
Off-center adjustment of welding head in inches	2¼	2¼	¾

This shows that welding time alone for the two external passes would be about 2¾ minutes while that for the internal bead would be almost a minute. Handling time for moving various sizes of pipe into and out of the welding fixture remains constant. The only variable is the welding time which changes with pipe diameters.

Manpower

Personnel required for operation of the double-jointer yard totals 16, including a tractor operator, two pipe handlers, a tack welder, a spacer for line-up operations, a welder for making a 2-in. tack at each joint, two automatic welding operators, a clamp man, two pipe rollers, two automatic operator helpers, two grinders, a buffer, and a foreman.

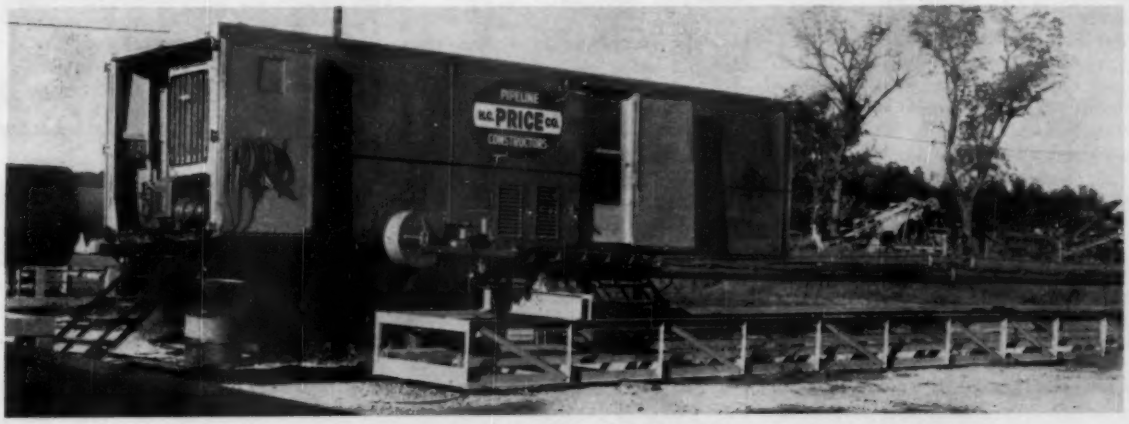
Procedure

How is pipe handling and welding accomplished?

Prior to welding, approximately 75 per cent of the pipe bevel is ground off with a special electric grinder. Deeper weld penetration is possible with the thicker land and snugly butted type of joint design characteristic of this technique for double jointing.

Grinding is done at a station on the incoming skidway where the two incoming joints are rolled into the feed-in trip.

Hydraulic power for each set of



POWER TRAILER contains diesel-driven generator, welding generators, switch gears, and work shop.

these trips is a self-contained power package consisting of an electric motor, controls, hydraulic pump, relief valve, and directional valve.

The grinders, each driven by 360-cycle motor, have been specially designed for maximum uniformity in the operation of trimming pipe ends to the dimensions required for the thicker land required by this type of welding.

After grinding, the pipe is rolled to the feed-in trip at the line-up rack.

By push buttons, the tack welder energizes hydraulic valves for placing first one joint, then the other on elevated lowering-in arms. Pipe is manually rotated to put the longitudinal seams in the proper offset positions. All other movement of the pipe is mechanized until the welding is completed.

Lowering-in arms lower the pipe on hydraulically powered "endo" rollers where either the tack welder or the spacer actuates movement of the clamp nest—containing the line-up clamp—toward the nearest joint.

Line-up

The spacer operates hydraulic valves to line up the pipe in vertical and horizontal planes. The line-up clamp is expanded as the pipe is aligned.

The next step is unusual. It involves an operation that is a characteristic feature of this technique: This operation is accomplished by deliberately positioning the end of the pipe—farthest from the clamp nest—so that the bottom side of the pipe is under compression at the welding position.

The two joints of pipe are then welded together on the bottom by a 2-in. single-bead tack weld applied manually by the tack welder. This is the only manual welding done in this double-joint procedure.

When the line-up and tack welding is completed, the spacer raises the turning rolls under the pipe. Balance points of the pipe are in such a position that—as the turning rolls lift the pipe—the top of the pipe is put under compression at the weld position. Simultaneously the tack weld at the bottom is under tension. Tensile force is not enough to cause the weld to fail.

External Welding

Meanwhile, during the time that the line-up and tacking operations have been carried on, the automatic welding operator has been moving the welding head into the welding position.

Positioning of the LAF-3 automatic welding head can be done manually in longitudinal and radial directions as well as on the off-center location. Once the desired positions have been achieved, the self-compensating automatic welding head carriage will automatically maintain these positions regardless of any "dog leg" or out-of-roundness in the pipe. The automatic welding carriage wheels ride on the pipe, thus automatically tracking the pipe travel.

After the pipe is raised on the turning rolls, the automatic operator starts the rolls turning. This is an all-electric operation even to the remote control of the turning speed.

The two external passes are now made with the automatic welder.

Internal Welding

On completion of external welding, the tack welder lowers the turning rolls. The line-up clamp returns to its nest. Kickout arms are raised. The double joint is ejected from the line-up rack and rolls down a skidway to hydraulically operated feed-in trips at the internal weld rack.

The man known as the hydraulic control valve operator (or internal automatic welder's helper) serves a dual function of operating the hydraulic controls and helping the inside automatic welding operator.

After the pipe rests on the turning rolls, the helper attaches the ground lead and the inside welding operator manipulates controls of the hydraulic powered boom which propels him into the pipe. Like the external welding head, the internal one is also of the Lincoln LAF-3 type.

After completion of one welding pass inside the pipe, the boom is retracted. The helper then hydraulically kicks the pipe onto the outgoing skidways—the last step in the double-jointer procedure.

Significant Features

Special mention should be made of certain notable features of the new double jointer unit. These provide a number of advantages.

Line-up operations . . . The pipe-handling rack equipment has been designed so that solenoid-valve control prevents bouncing of the pipe when it rolls from the incoming skidway to the lowering-in arms of the line-up rack. This provision avoids damage to the hydraulic system which can come from repeated shocks from the dropping of the pipe.

Skidways . . . Shock absorbers under the skidways cushion against shocks and reduce vibration and fatigue of the structural parts.

In assembling the skidways, quick positioning of skidways is facilitated by dowel pins. Alignment of skidways is obtained by adjusting screw jack supports or horses.

Dismantling and assembly . . . For a 20-mile move to a new location, all of the double-jointer equipment can be torn down, transported, and set up in 1 day.

Basic Operations of External Welding Rack

There are altogether 11 solenoid pilot-operated hydraulic valves for the eight basic operations of the external welding rack:

1. Tripping the pipe into the lowering-in arms of the rack—two valves (one for each of two sets of skids);
2. Lowering-in arms—two valves;
3. Endo rollers—two valves;
4. Vertical adjustment—one valve (for raising and lowering end of the pipe);
5. Endo roller for horizontal adjustment—one valve;
6. Lifting of turning rolls—one valve;
7. Kick-out arms—one valve;
8. Controls for offset of welding head—one valve.

Power Trailer

The power plant is installed in a trailer divided into two sections. Rear section has one diesel generator set, (150-kw, 240-volt, 3-phase); three 750-amp. welding generators (one is a standby); three 35-volt MG exciters (one is standby); and one 300-amp. welding generator (for tack welding).

The forward section contains electrical switch gear and protective devices plus workshop and office area.

Conclusions

The new double jointer has been developed to cut big-inch pipe-laying costs for projects built over considerable stretches of flat or gently rolling country.

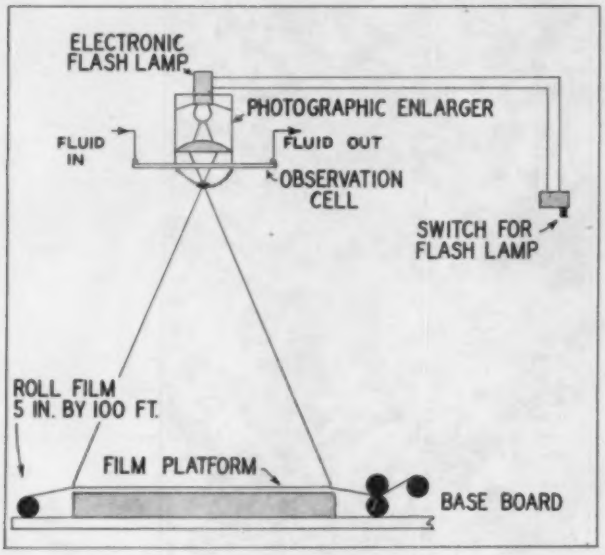
High-quality welding is obtained by a completely mechanized technique which can be applied in the coldest as well as the hottest climates.

In addition to the large savings due entirely to greater spread footage output, there are often savings due to lower cost of stringing the longer joints.

On foreign work and other projects where manual welders are scarce there would be an advantage in having half of the welding for the project done by a double jointer before the pipe is strung on the right-of-way.

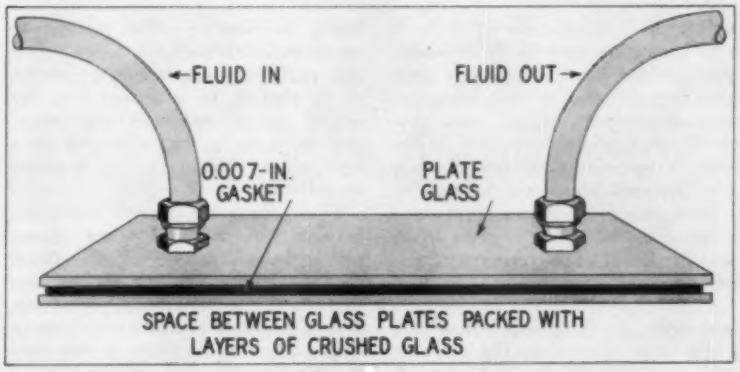
Under the conditions for which the double jointer has been designed savings for a pipe laying project could amount to several times the cost of the equipment.

Fig. 1



Modified photographic enlarger casts an enlarged image . . .

Fig. 2



of an observation flow cell on photographic film. Negatives may be studied directly, or prints therefrom, in this, a . . .

New Technique for Study of Fluid Flow and phase distribution in porous media

By O. K. Kimbler and B. H. Caudle
Atlantic Refining Co.

A PHOTOGRAPHIC technique has been developed to observe fluid displacement over large areas of porous media while at the same time detailing the individual pore spaces. Numerous displacement studies have been made with the technique. Some of the important observations from these studies are:

- Residual gas and residual oil are not distributed randomly in the porous matrix but exist as discreet, discontinuous globules in reproducible locations.
- Gas evolves from solution in a porous matrix at widely isolated spots. Further evolution merely enlarges these original nuclei.
- High rates of two-phase flow through porous media changes the flow paths. Possibly serious errors may be made in multiphase-flow studies when high rates are used.

Introduction

During the past few years, we have realized a need for more knowledge of the mechanics of fluid flow within the pore spaces of reservoir media to evaluate properly the oil to be recovered from reservoirs subjected to various recovery practices. The industry has been trying to develop such mechanistic concepts from both theoretical and experimental techniques. This article presents a technique for visual observation and photographic recording of displacement phenomena in porous media and some of the results obtained with this technique.

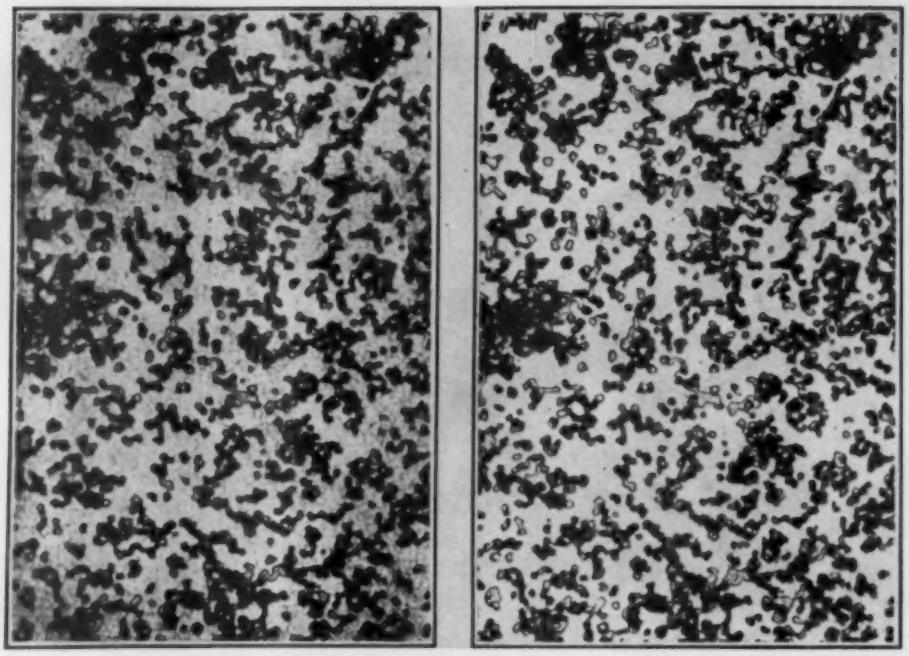
Studies of this nature have been reported by the personnel of API Project 47-B at University of Oklahoma.[1] One technique in their studies was to use a standard binocular microscope to observe the location, configuration, and movement of fluids within small transparent observation flow cells. Such a technique is ideally suited for the observation and recording of phenomena occurring within a single pore space or over short distances within the cell.

Much the same technique has been used by the authors in basic mechanistic studies. In these studies, it became apparent that the inability of the operator to observe large areas of the flow cell was a serious limitation. A similar technique was needed wherein much larger portions of the porous media could be observed while the ability to observe individual pore spaces in this area was retained.

The method devised, which is called the "enlargement technique", makes use of photographic enlargement procedures to record fluid flow and phase-distribution phenomena in areas of porous matrices containing thousands of pore spaces and at such magnification that each pore space may still be seen individually.

Experimental Apparatus and Technique

The enlargement technique uses a modified photographic enlarger to cast an enlarged image of an observation flow cell on photographic film.



RESIDUAL GAS. Comparison of two displacements under identical conditions. Fig. 3.

Various fluids present in the cell are caused to photograph differently by virtue of: (1) major differences in refractive index, (2) natural coloration of one of the fluids, or (3) suitable dyes added to one or more of the fluids. Photographic negatives obtained upon development may be studied directly or used to produce prints or enlargements suitable for detailed study.

Fig. 1 presents a schematic diagram of the basic apparatus. The enlarger was a 3¼ by 4¼-in. condenser-type photographic enlarger with a 4-in. lens. The negative carrier was modified to hold rectangular flow cells of the type described below.

The conventional incandescent lamp and reflector were replaced by an electronic flash unit in order to provide intense illumination for extremely short time intervals, so that sharply detailed photographs might be made during periods of fluid flow. This speed light gave exposures on the order of 0.001-second duration and was sufficient to stop the action of the fluid flow insofar as the photograph is concerned.

The base of the apparatus was designed to hold and transport film which was 5 in. wide by 100 ft. long. The easel was designed to provide a recorded image which was 4 in. wide by 12 in. long. The apparatus was used in a photographic dark room equipped with standard safe lights.

Flexibility . . . This operation is very flexible, as enlargements of from 4 to 60 diameters were easily obtained. Enlargements of 12 diameters provided enough detail in most instances. Manual transport of the film permitted sequence photographs to be made at intervals of a few seconds. More frequent shots can be had by a mechanized film transport and modification of the electronic flash lamp to permit rapid recharge of the condensers.

Flow cells . . . Observation flow cells of the type shown in Fig. 2 were used in this work. Similar cells are described in the literature in connection with microscopic studies. These cells consist of two flat glass plates 1 by 6-in. in size cemented together around the edges and with a space of about 0.008 in. between the plates. Inlet and outlet fittings are provided to permit fluids to be forced through the observation cells.

Porous matrices were composed of three layers of glass spheres or of graded pyrex frit. After packing, the matrices were lightly consolidated by treatment with an alcoholic solution of tetraethyl orthosilicate. Such cells were found to perform well over long period of time at working pressures below 15 psi., and in many cases were found to be suitable for limited use up to pressures of 50 psi. The cells, as originally constructed, were water wet, but the wettability can readily be altered by treatment with commercial silicone materials.

Using the cell . . . The manner in which the cell is used will depend upon the particular displacement process to be studied. In a typical case the cell is initially saturated with water and the water is then displaced by a light oil to simulate virgin reservoir conditions.

If it is desirable later to distinguish between the oil and water phases photographically, one of the fluids may be colored by the use of dye prior to this step. Generally speaking, it is desirable to avoid the addition of dyes to the wetting phase as they tend to adsorb onto the matrix. Gas is the most readily distinguishable phase in studies such as these due to its relatively low index of refraction, which causes the boundaries between the liquid and gas to be sharply defined.

Desired fluid flow is carried out with the cell in place in the negative holder of the enlarger. Small constant-rate positive-displacement pumps were generally used to provide close control over flow rates.

Preliminary adjustments of focus and positioning of the cell to show the area of interest were made with the standard enlarger lamp housing in place. The electronic flash lamp was then repositioned and used to make exposures during the run.

If identical portions of the observation cell are to be observed in two or more experimental runs, identification marks are etched on the glass surfaces to allow exact replacement of the

PHOTOGRAPH No. 1 ELAPSED TIME 10 SEC.

PHOTOGRAPH No. 2 ELAPSED TIME 20 SEC.

PHOTOGRAPH No. 3 ELAPSED TIME 30 SEC.

PHOTOGRAPH No. 4 ELAPSED TIME 40 SEC.

PHOTOGRAPH No. 5 ELAPSED TIME 50 SEC.

EVOLUTION of gas within a porous matrix. Fig. 4.

observation cell in the negative carrier. Portions of typical photographs obtained by this method are presented in Figs. 3-5.

Displacement Studies

Several types of studies detailed in the following discussion the usefulness of the photographic enlargement technique in formulating concepts of fluid-displacement mechanisms in porous media. Examples are: (1) the configuration of residual oil and residual gas as the result of displacement by the wetting liquid; (2) the evolution of gas from a supersaturated solution in a porous matrix; and (3) some effects of flow rate on the fluid phase configurations during simultaneous two-phase flow through porous media.

Although the particular examples were chosen to illustrate the technique, they also demonstrate some of the more important concepts of fluid which were obtained in these studies.

1. Residual Oil and Gas

In this study a cell of the type shown in Fig. 2 was made of 150-mesh pyrex frit consolidated with tetraethyl orthosilicate. The gas-saturated cell was then subjected to a displacement by water. Two of these runs were made under identical conditions, and the positions of residual gas in the same area of the cell were recorded photographically. A portion of these photographs is shown in Fig. 3.

In these photographs the clear areas contained the displacing water, while the residual gas globules are seen as either dark areas or as light areas surrounded by a heavy dark line. Comparison of the photographs shows the positions occupied by the individual gas globules to be essentially identical in both photographs.

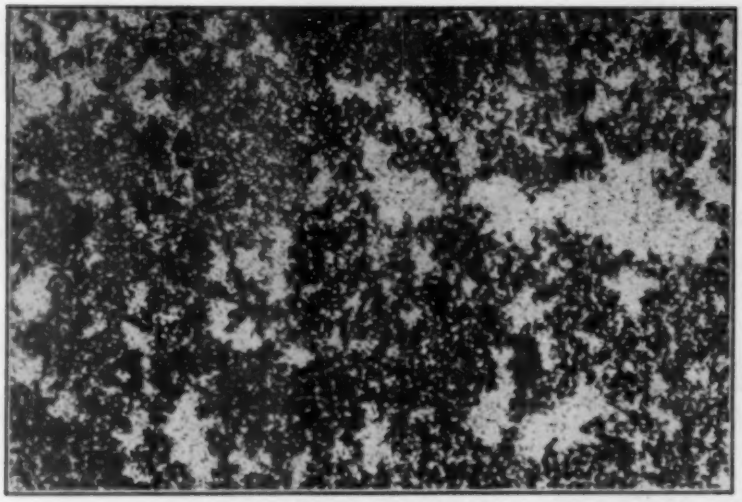
Not random . . . A large number of such photographs in numerous displacements of gas by water and of oil by water have demonstrated that the location and configuration of the residual phases in immiscible-phase displacement is not random, but is reproducible and identical in runs performed under very similar conditions. Changing the conditions of the experiment, such as changing the flow rate or the interfacial tension, resulted in surprisingly slight changes in the configuration of the residual phases. In fact, the position of residual oil to water drive was found to be nearly identical to position of residual gas by water drive.

It has also been noted that residual-phase globules of nonwetting material consistently occupy an entire pore space or several pore spaces as a unit. The coexistence of two immiscible phases in a single pore space has never been observed by the authors, with the exception of the existence of residual wetting phase after drainage-type displacements.

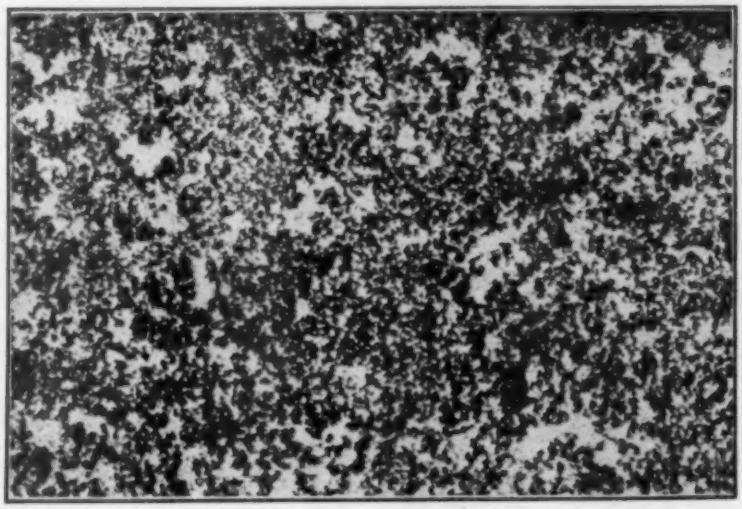
2. Evolution of Gas

For this study, a cell of consolidated pyrex frit was saturated with oil containing gas in solution at 30 psig. With the cell in place in the enlargement apparatus, the external pressure on the cell was rapidly reduced to atmospheric pressure and a series of photographs were made during the short time in which the gas came out of the solution. These photographs are shown in Fig. 4, the first photograph being taken approximately 10 seconds after the pressure had been reduced from the cell, and the other photographs at approximately 10-second intervals thereafter.

Gas nuclei grow . . . Initially very



A. FLOW RATE 10 FT. PER DAY.



B. FLOW RATE 100 FT. PER DAY.

SIMULTANEOUS FLOW of oil and water, water-oil ratio 6:1. Fig. 5.

few bubbles appeared in the matrix of the cell under observation and thereafter essentially no new gas nuclei were formed in this area. The subsequent evolution of gas took place on the nuclei causing them to grow rapidly and to eventually link up to establish continuity of the gas phase.

In this case the movement of dissolved gas through the liquid with subsequent evolution into an existing gas nucleus takes place more rapidly than the formation of new nuclei. Upon the establishment of gas continuity, as seen in picture No. 5 of this series, subsequent gas evolution produced no significant additional oil but merely flowed out the gas channels. An external gas drive, however, would ultimately yield much greater oil production. Such behavior is in agreement with the previously published concept of Stewart and coworkers.[2]

3. Effect of Rate in Two-Phase Flow

For this series of studies a pyrex-filled cell, similar to those described above, was also used. The matrix was initially saturated with water and was then subjected to a simultaneous flow of water and oil in the ratio of six volumes of water flowing to one volume of oil. The linear flow rate was approximately 10 ft. per day.

Under these conditions, the oil and water quickly formed separate and distinct flow channels as shown in Fig. 5-A. In this photograph the oil is seen as dark interconnected areas within the pore spaces while the water occupies the light areas and retains communication through channels in pore spaces masked by the oil phase. These channels did not change over a long period of fluid flow.

Rate increase . . . Retaining the same water-to-oil flowing ratio, the linear rate of flow was advanced to approximately 100 ft. per day. Under these latter conditions, the discreet channels shown in Fig. 5-A were broken down and oil and water were observed to move heterogeneously through the porous media as shown in Fig. 5-B.

In this photograph, the oil (dark globules) is seen to be throughout the matrix in a more uniform manner. The tortuosity of the flow paths is much less than that shown in Fig. 5-A. This was not a stable condition as the interface fluctuated rapidly and the short duration of the electronic flash was necessary in order to obtain a clear photograph.

A subsequent lowering of the flow rate to that first used did not cause the fluids to resume their original flow paths.

Although these flow rates are above those which are encountered in a petroleum reservoir, they compare with the flow rates often used in the laboratory on small core samples. The results of this study indicate the possibility of serious errors in multiphase flow studies made at high rates of flow.

Acknowledgment

The authors wish to express their appreciation to G. W. DeArmond, Jr., for his assistance in carrying out the experimental work presented in this paper.

References

1. Chatenever, A., and Calhoun, J. C., Jr., Trans. AIME, 195, pp. 149-56 (1952).
2. Stewart, C. R., Hunt, E. B., Jr., Schneider, F. N., Geffen, T. M., and Berry, V. J., Jr., T.P. 2962, Journal of Pet. Tech., V.I. No. 12, pp. 21-28 (1954).

"This one says we can increase efficiency by putting someone on full time taking up office collections."

THE OIL AND GAS JOURNAL

In its November 18 issue the Journal presented a symposium on problems associated with static electricity and its control. Here is another article on the subject, with some down-to-earth suggestions on . . .

How to Control Static Electricity in Commercial Tankage

By W. M. Bustin, T. L. Culbertson, and C. E. Schleckser, Jr.
Esso Research & Engineering Co.

STATIC ELECTRICITY which is generated in hydrocarbons during normal operations occasionally causes a spark in a tank vapor space. During the past 10 years, 18 fires suffered by Standard Oil Co. (N. J.) have been attributed to static electricity. Current safety measures include low pumping rates, avoidance of surface agitation and water, and use of floating-roof tanks to eliminate the vapor space. Tanker compartments are gas freed when necessary. Carbon dioxide gas blanketing is planned for some barge operations.

Experimental work has confirmed that electrical current generated in pipeline flow is given by:

$$I = (TKV^{1.75})\ (1 - e^{-L/TV})$$

Where:

- I = current issuing from line with fuel.
- T = fuel time constant.
- K = factor determined by pipe diameter and fuel-pipe interface.
- V = velocity.
- e = base of Napierian logarithms.
- L = pipe length.

As suggested by this formula, an enlarged pipe section allowing low velocity for a short period of time will materially reduce the static charge. Filters of the type to be used in aircraft loading systems generate substantial charge in the fuel which can be reduced by a downstream tank of practical dimensions.

A probe for quantitative measurement of electrostatic fields with minimum field distortion has been developed. This probe will be used to explore electrostatic fields in a 10,000-gal. tank arranged for large-scale static-electricity studies.

Tests have shown gaseous carbon dioxide blanketing to be effective and practical in preventing explosive vapors.

Paper presented at API annual meeting, Chicago, under the original title, "General Considerations of Static Electricity in Petroleum Products."

Tankage . . . A summary of recommendations for handling JP-4-type stocks in refineries and other shore tankage is as follows:

1. Tank blending should be carried out in floating-roof tanks to eliminate the vapor space. Gas-blanketed cone-roof tanks are acceptable as an alternate but, because of the problems associated with obtaining a reliable supply of and maintaining adequate control over the blanketing media, floating roofs are preferred.

2. Although floating roofs or gas blanketing are not imperative for tanks used only for storage, such facilities offer a higher degree of safety than unblanketed cone-roof tanks. The need for this additional protection should be examined in light of the practicability of complying with other recommendations aimed at minimizing static generation.

3. When handling these products in cone-roof tanks or other vessels with an unblanketed vapor space, the following precautions should be observed:

(a) Do not use overhead or splash filling.

(b) Do not agitate with air, steam, or gas, or with mechanical mixers. Avoid agitation by other means such as jet nozzles and recirculation. Where only cone-roof tanks are available for blending, the hazard may be minimized by converting to line blending or cutting the product to specification direct from a distillation unit.

(c) Exercise special care to avoid water bottoms or other contamination of the product with water. Do not pump oil-water mixtures or displace pipelines with water. Avoid entraining air with products being pumped into a tank.

(d) Endeavor to keep velocities of stocks entering tanks or vessels to a practical minimum. Reduced velocities are particularly advisable during the start of tank filling until the inlet nozzle has been well submerged. This last point should be particularly watched on tanks equipped with swing lines and product lines with elbows facing upward.

The incoming stream should not be allowed to break through the liquid surface. One method which can frequently be used for keeping velocities to a minimum during the initial filling is to flow by gravity from another tank.

4. Pulling down of a floating-roof tank to the point where the roof rests on its legs should be avoided. However, if this should occur, the tank should be treated as a cone-roof tank.

5. All cone-roof tanks should have

suitable weak circumferential roof seams.

6. No one should be allowed on top of cone-roof tanks while pumping in, blending, or mixing operations are taking place. Also, before allowing anyone to go to the roof after such operations, an interval of at least 15 minutes should be allowed to permit sufficient time for relaxation of any static charges which might have been generated.

Tank trucks and tank cars . . . In tank-truck and tank-car handling of JP-4-type products, the following precautions are observed:

1. Tank cars and tank trucks should be adequately bonded to the fill line or nozzle.

2. The fill line should extend to the bottom of the tank.

3. The rate of flow should be kept low until the end of the fill pipe is well submerged.

Ocean tankers . . . In handling JP-4-type products in ocean tankers, the following precautions have been adopted:

1. Ship's pipeline should be carefully drained to prevent contamination of incoming product with water.

2. Reduced loading rates are in effect throughout the entire loading operation. The restricted rates limit the velocity of flow through the branch line to the individual compartment to approximately 3 ft. per second. The total loading rate should not exceed the sum of the permitted rates for the individual tanks being loaded.

Procedures for handling kerosine and other light distillates having similar vapor-pressure and flash-point characteristics in ocean tankers are as follows:

1. Tanks should be washed or ventilated or both and scale removed as necessary to insure that the tanks into which the product is being loaded are gas-free immediately prior to loading. For this purpose, tanks are considered gas-free when vapor concentration does not exceed 20 per cent of the lower explosive limit.

2. Gas tests should be made in each of these cargo compartments immediately prior to start of loading. The tests should be made by lowering the sample tube within 2 ft. of the bottom of the empty compartment, and this should be done after the vessel's piping system has been lined up and the valves opened into the individual compartments.

3. The ship's pipelines should be carefully washed and drained to prevent contamination of incoming product with previous cargo or with water.

4. After taking the above precautions, a kerosine-type product may be loaded without rate restriction provided more volatile products are not being handled simultaneously. If, however, parcels of gasoline are being handled simultaneously, reduced loading rates, similar to those for loading JP-4, have been established.

Furthermore, ship's personnel have been warned that when simultaneously loading products of high flash point and low flash point into tanks sharing a common venting system, pressure-vacuum relief valves on branch vent lines of tanks receiving products of high flash point should be in the operating position, and such tanks should be vented through the screened ullage openings to the atmosphere.

Barges . . . Barge loading of JP-4-type products is done at reduced rates until sufficient product has been loaded to preclude splashing and extreme turbulence within the barge tank. To accomplish this, valves are opened into all tanks before the start of loading, and initial loading is done by gravity. After sufficient depth above the bellmouth is reached, loading is completed at normal loading rates.

In barge loading of kerosine, special precautions are not required in many domestic operations. A sequence of cargoes transported often can be established so that cleaning operations to carry kerosine are minimized. Where gas-freeing operations are not possible and kerosine must be loaded on gasoline bottoms, the same procedures are followed as with JP-4.

Aircraft . . . In the loading of JP-4 into aircraft, no static preventive measures have been used beyond the normal bonding requirements used with aviation gasoline. These procedures, of course, do not protect against the possibility of static sparking within the vapor space of the plane's tanks during loading.

Present procedures do not eliminate the possibility of froth or mist ignitions with kerosine-type products which will not generate their own combustible vapor-air mixture.

In all of the 18 static fires previously mentioned, either the product was being handled at a temperature above its flash point, or contamination of the vapor space by a low-flash product was apparent.

A number of oil companies have adopted CO_2 or inert-gas blanketing during barge and tanker loading of certain products as a means of preventing static explosions. The most widespread application of this type has been the use of dry-ice blanketing.

The Baton Rouge refinery of Esso Standard Oil Co. ran an extensive test program on CO_2 blanketing last year. It was concluded that a more effective method of blanketing was the utilization of a liquid CO_2 converter and admission of the gaseous CO_2 through the vessel's regular piping and loading lines. The company is proceeding with the installation of a CO_2 converter system in view of the large number of charter barges that it loads and over which it has little control.

Experimental Studies

A pipeline static generation test setup used for studying pipeline charging

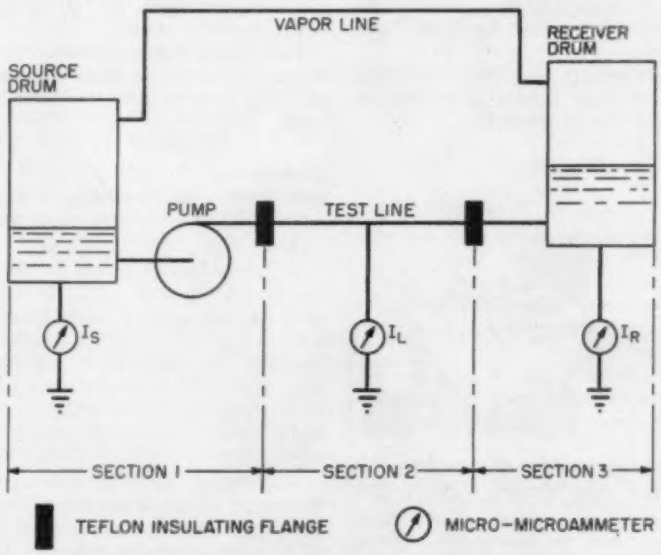


Fig. 1—Static generation test used for studying pipeline charging.

is shown in Fig. 1. Hydrocarbon is pumped from the source drum by the positive-displacement pump through the stainless-steel test line to the receiving drum. The polyethylene vapor line maintains a closed system with no evaporation losses.

A stainless-steel rather than carbon-steel test line is used to avoid changes in charge generation caused by chemical changes at the oil-pipe interface. Teflon insulating flanges are provided as shown for electrical insulation. In addition, the entire system is insulated from ground and electrostatically shielded with copper screen.

The test procedure consisted of measuring the current in the three ground lines under a variety of flow rates and line lengths. Table 1 tabulates some of these data obtained with JP-4 and ¼-in.-diameter stainless-steel tubing. Within experimental error, the sum of the three line currents (given in the sixth column) is zero. A plot of line current versus pipe length obtained by interpolation from these data is shown in Fig. 2. The general shape of these curves holds for other hydrocarbons. However, the magnitude and sign of line current will vary with different hydrocarbon samples even when they are of the same specification. Consequently, these results should not be used as representing the actual magnitude of charge generation with JP-4.

TABLE 1—CURRENT GENERATED DURING PUMPING THROUGH ¼-IN.-DIAMETER STAINLESS-STEEL TUBING

Length of test line (ft.) L	Velocity (feet per second) V	Source current, Section 1 I_S	Line current, Section 2 I_L	Receiver current, Section 3 I_R	Sum of currents $I_S + I_L + I_R$	Computed line current I_L'	$I_L - I_L'$
72.5	6.1	—0.9	—32	32	0.9	—48.5	16.5
72.5	2.6	...	—3.6	3.8	...	...	...
72.5	9.2	5	—95	90	0	—98.5	3.5
72.5	14.25	33	—200	160	7	—201	1
72.5	18.9	80	—310	220	10	—315	5
72.5	24.2	165	—430	260	5	—428	2
72.5	30.7	320	—590	260	10	—588	2
72.5	35.8	540	—700	130	30	—742	42
72.5	36.8	760	—800	...	...	—846	46
72.5	30.2	350	—580	180	50	—601	21
72.5	24.1	170	—410	230	10	—430	20
72.5	19.1	75	—295	220	0	—303	8
72.5	13.9	24	—185	160	1	—187	2
72.5	9.1	2	—79.5	76	1.5	—94.6	15.1
72.5	5.7	—1	—23.5	24	0.5	—43.0	19.5
22.5	6.3	—1	—25.5	26	0.5	—34.2	8.7
22.5	17.3	30	—100	68	2	—109	9
22.5	30.8	175	—195	11	9	—200	5
22.5	47.2	670	—340	—370	40	—324	14
44	47.6	800	—710	—200	110	—642	58
44	27.1	90	—320	210	20	—313	7
44	9.83	—2.6	—75	78	0.4	—83.8	8.8
53	33.3	195	—480	260	25	—443	37
53	20.4	30	—255	220	5	—240	15
5	27.4	44	—44	...	...	—39.2	4.8
5	47.6	205	—80	—120	5	—60	20
10	45.5	190	—140	—48	2	—119	21
10	26.5	40	—80	42	2	—74.1	5.9
1	28.6	54	—19.5	—32	2.5	...	...
1	50.0	215	—32	—180	3	...	...

Note: All currents are in units of 10^{-10} amp.

Results and conclusions . . . The current from Sections 2 and 3 through the meters would be expected on purely theoretical grounds to be given by the following equations:

$$I_L = -(TKV^{1.75} + I_S)(1 - e^{-L/TV}) \quad (1)$$

$$I_R = -I_S - I_L \quad (2)$$

Where:

I_L = current from Section 2 to ground through micro-micro-ammeter (in amperes × 10^{-10}).

T = hydrocarbon time constant, that is resistivity times dielectric constant (in seconds).

K = proportionality factor determined by pipe diameter and charge-generating tendency of hydrocarbon-pipe interface.

I_S = current from Section 1 to ground (in amperes × 10^{-10}).

e = base of Napierian logarithms (approximately 2.72).

L = length of test pipe (in feet).

V = average velocity of flow (in feet per second).

I_R = current from Section 3 to ground (in amperes × 10^{-10}).

By calculation the best values of T and TK, to fit the data in Table 1, were found to be T = 3.4 seconds and TK = 2.15 with current in units of 10^{-10} amp. and velocity in feet per second. Independent measurement of hydrocarbon resistivity indicated that T should be approximately 3 seconds providing good agreement with the noted value.

Because the values chosen for the two constants T and TK provide good agreement over a wide range of pumping velocities and line lengths, the

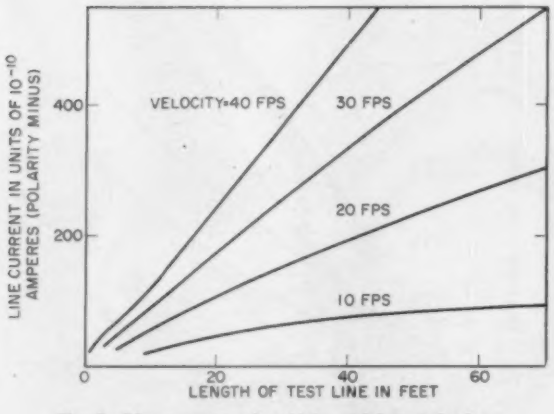


Fig. 2—Line current using ¼-in. stainless-steel pipe.

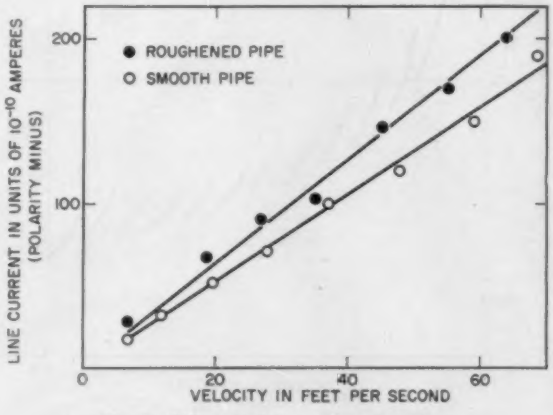


Fig. 3—Line-current for carbon-steel pipe.

equation for line current appears to be of essentially correct theoretical form.

It was found that roughening a 5-ft. length of carbon-steel pipe by cutting a double spiral in the wall increased the pressure drop and charge generation in the same proportion. Fig. 3 shows this increase in charge generation.

Various amounts of water above the saturation level of the hydrocarbon were added during some of the pumping tests. The test results are tabulated in Table 2. Apparently free water had little effect on the pipeline static generation, but caused a drop in source current. The reason for this drop is not apparent.

Static generation in neoprene hose, clean carbon steel, and rusted carbon steel was also measured. The current drifted during runs suggesting that some sort of chemical reaction or adsorption was occurring at the interface. Fig. 4 giving the line current as a function of time for 15 successive runs, shows the drift using a length of clean carbon steel.

Fig. 5 shows the line current for 20-ft. tubing lengths of the various materials. The shaded areas represent the range over which the current was obtained after partial stabilization from repeated runs.

As the data in Figs. 4 and 5 show, charge generation depends not only on the pipe material but also on its condition and past history. Consequently, the differences among the materials shown in Fig. 5 should not be interpreted to mean that one material, such as rusted carbon steel, always produces more charge but rather that unpredictable variations will occur in practice which are as great as those caused by pipe material.

TABLE 2—EFFECT OF FREE WATER ON CURRENT GENERATION

Water per cent by weight	Velocity, 24.5 ft. per sec.		Velocity, 40.5 ft. per sec.	
	Source current	Test line current	Source current	Test line current
0.0	105	—165	295	—300
0.09	7.2	—185	80	—325
0.18	28	—140	180	—250
0.27	21	—140	160	—260
0.35	13	—145	140	—260
0.44	8	—145	130	—265

Note: All currents are in units of 10^{-10} amp.

In addition to the tests on JP-4, tests were conducted on kerosine and aviation alkylate. The results plotted in Fig. 6 show a substantial spread among the three samples.

Electrification in Storage Tank

Charge in stationary hydrocarbon relaxes exponentially at a rate determined by the hydrocarbon resistivity and dielectric constant:

$$Q = Q_o \epsilon^{-t/T} \qquad (3)$$

Where:

Q = charge density after elapsed time t.
Q_o = initial charge density.
ϵ = base of Napierian logarithms.
t = time.
T = hydrocarbon time constant (resistivity times dielectric constant).

In recirculation tests, water was added to the hydrocarbon. It was interesting to note that not only was a higher potential produced than with the dry hydrocarbon, but the potential also remained for a longer time after pumping ceased. It appeared to decay at a rate corresponding to a time constant of about 25 seconds compared to a dry hydrocarbon time constant of approximately 2 seconds.

The amount of water involved was sufficient to make an unstable emulsion during pumping. Water droplets in oil are known to carry a small charge corresponding to a potential difference of approximately 1 volt at the interface. During settling the large number of falling, charged-water droplets add up to a substantial transfer of charge from the body of the liquid to the tank bottom. The hydrocarbon retains the corresponding charge of opposite sign.

This mechanism seems to explain the greater potential with water present as well as the apparently slower decay actually caused by the continued settling and charge generation after shutoff of the pump.

Resistivity of Commercial Fuels

Approximately 40 samples of common hydrocarbon products were measured for resistivity. Products were chosen which at ambient temperature produce an explosive air-vapor mixture or a lean mixture which could be enriched by contamination from more volatile products. The measurement was made by placing the sample in the gap between two concentric

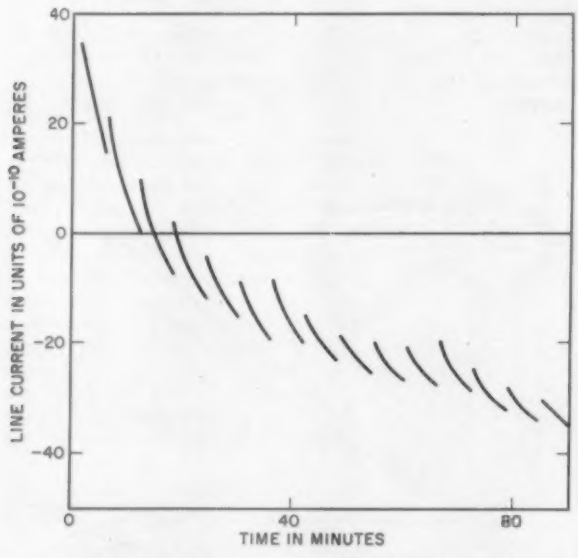


Fig. 4—Change in line current during successive runs.

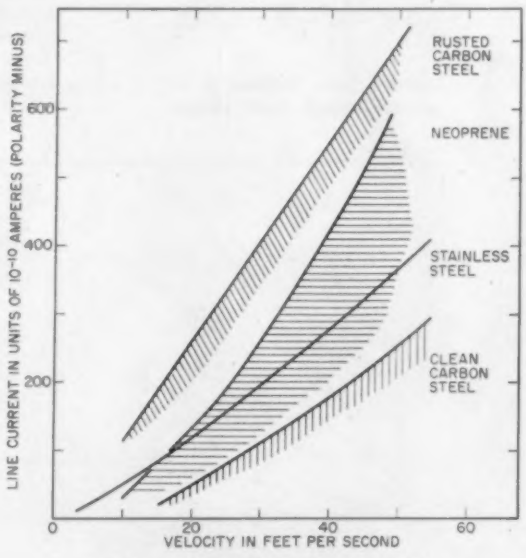


Fig. 5—Line current for various materials.

TABLE 3—COMMON PETROLEUM PRODUCTS MEASURED FOR RESISTIVITY

Product	Resistivity range (Ohm-cm.) Low	High
JP-4	9.9×10^{11}	1.2×10^{13}
JP-4	1.8×10^{13}	2.8×10^{14}
JP-4	1.2×10^{13}	8.8×10^{13}
JP-4	4.1×10^{13}	1.9×10^{14}
JP-1	9.2×10^{13}	2.7×10^{14}
Kerosine	4.1×10^{13}	3.0×10^{14}
Kerosine	9.0×10^{10}	2.8×10^{11}
Kerosine	1.1×10^{14}	2.6×10^{14}
Kerosine	1.2×10^{13}	1.7×10^{14}
Kerosine	5.8×10^{13}	7.3×10^{14}
Kerosine	3.2×10^{13}	3.8×10^{14}
Aviation alkylate	1.5×10^{15}	1.1×10^{16}
Aviation hydroformate	3.3×10^{12}	8.2×10^{12}
Petrohol	9.2×10^{6}	9.8×10^{6}
Alcohol F-38	5.8×10^{6}	7.0×10^{6}
Varsol No. 1	6.6×10^{11}	5.0×10^{12}
Varsol No. 2	1.0×10^{12}	1.4×10^{12}
Varsol No. 2	7.0×10^{13}	1.8×10^{14}
Varsol B	1.5×10^{14}	9.5×10^{14}
Varsol high flash	3.0×10^{14}	1.2×10^{15}
Solvesso 100	3.9×10^{13}	6.4×10^{13}
Toluene	1.1×10^{12}	8.0×10^{12}
Toluene	5.6×10^{12}	2.7×10^{13}
Xylene	2.4×10^{12}	3.0×10^{13}
Xylene	3.6×10^{12}	1.2×10^{13}
Heptane	4.9×10^{13}	1.2×10^{14}
Heptane	9.4×10^{14}	4.5×10^{16}
Octane	1.9×10^{13}	5.0×10^{13}
Octane	2.8×10^{13}	1.5×10^{16}
Tractor fuel	4.3×10^{13}	5.2×10^{13}
Tractor fuel	4.3×10^{13}	3.0×10^{14}
Tractor fuel	8.9×10^{13}	4.5×10^{14}
Tractor fuel	2.8×10^{13}	5.8×10^{13}
Diesel fuel	2.8×10^{12}	3.1×10^{12}
Diesel fuel	2.8×10^{12}	3.1×10^{12}
Bunker C	8.1×10^{6}	8.6×10^{8}
Heating oil	3.9×10^{6}	4.6×10^{8}
Heating oil	4.3×10^{12}	5.4×10^{12}
No. 5 fuel oil	1.3×10^{10}	1.4×10^{10}
Solvent naphtha:		
No. 1	1.7×10^{14}	5.9×10^{15}
No. 7	9.2×10^{13}	7.1×10^{15}
Heavy cat naphtha	1.8×10^{13}	3.5×10^{13}

metal beakers, applying a voltage between the beakers, and observing the current.

Resistance of the sample, equal to the applied voltage divided by current, was converted to resistivity by multiplying by the appropriate scale factor determined by the geometry of the beakers.

Two factors were found to affect the resistivity: (1) the duration; and, (2) the magnitude of the voltage applied. Fig. 7, showing a typical run, illustrates the type of variation with these factors. Presumably the applied voltage causes migration of the charged particles in the hydrocarbon to the beaker surfaces thereby depleting the hydrocarbon of charge carriers.

Some sort of regeneration effect must be present, however, inasmuch as the resistivity levels off to a new value after each change in voltage. Table 3 lists the range of resistivity for each sample.

Two conclusions are apparent from inspection of this table. First, the resistivities of most finished petroleum products lie between 10^{10} and 10^{16} ohm-cm. Second, the resistivities of several samples all meeting the same specification frequently vary.

Resistivity 10^{10} ohm-cm. is often considered to separate safe from potentially dangerous hydrocarbons as far as charge buildup is concerned. Thus most commercial products of the type tested can fall above the safe limit. A notable exception is alcohol. The resistivities of even very high purity alcohols of low molecular weight lie around 10^{6} ohm-cm.

Antistatic Devices

By far the most effective device has been found to be an enlarged pipe section herein referred to as a "relaxation tank." This term is chosen because operation depends on the normal relaxation resulting from the self-repulsion of the charges in the fuel.

The tank is sized so that the linear velocity of the oil is too low for appreciable charge generation caused by friction at the wall. With adequate residence time it is then possible to take advantage of normal relaxation such as would occur in a stationary hydrocarbon.

Limitations on free water and foreign particles in jet fuel are becoming more stringent, with the result that water separators and filters to remove particles larger than a few microns will be required in airplane-fueling systems. It was suspected that such filters would separate extremely large, possibly hazardous, amounts of charge.

This suspicion was based on work which had previously been done indicating large charge separation when passing hydrocarbon through a glass-wool plug. The surface area contacting the hydrocarbon is much greater in the plug than in a comparable length of pipeline. A similar situation occurs in a filter.

A series of laboratory experiments have been performed on a simulated airplane loading system using a filter

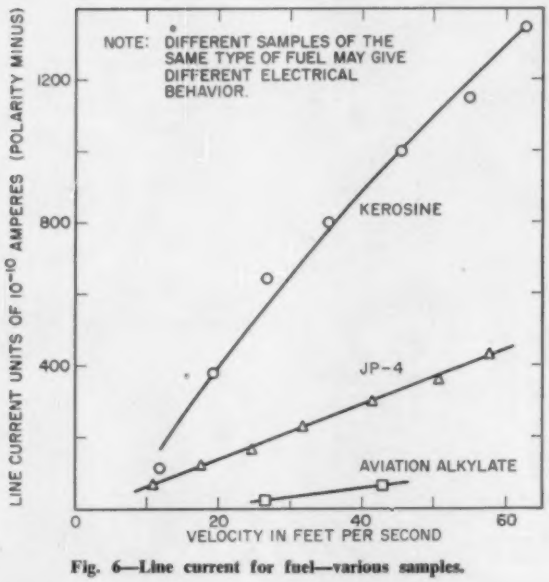


Fig. 6—Line current for fuel—various samples.

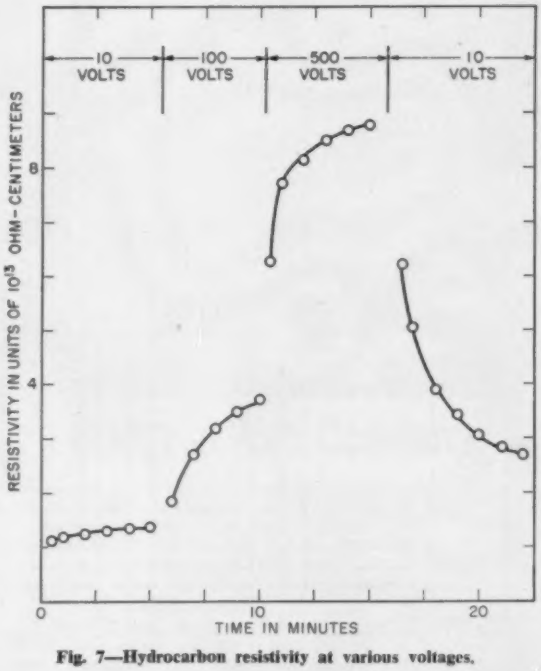


Fig. 7—Hydrocarbon resistivity at various voltages.

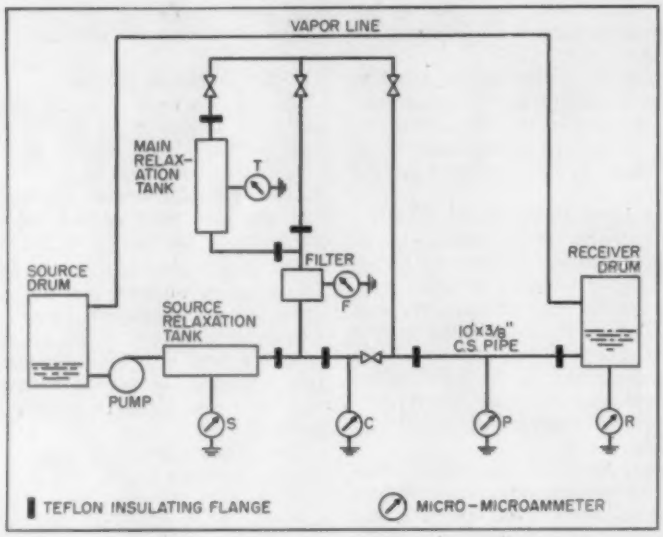


Fig. 8—Text-apparatus diagram showing charge separation in filters.

and a relaxation tank. Fig. 8 is a diagram of the test apparatus. The jet fuel is pumped from the source to the receiving drum by one of three different paths.

The paths are so arranged that the fuel can be pumped through a pipe section alone; through a pipe section preceded by a filter; or, through a relaxation tank placed between the filter and pipe section. The test sections are provided with valves to permit directing the fuel flow as desired. Flow rate can be varied from 0 to 10 g.p.m.

To prevent current generated in the positive-displacement pump from affecting charge generation in the downstream test sections, a 6-in.-diameter relaxation tank has been placed in series with the pump outlet. The main relaxation tank is the enlarged pipe section used to remove the charge put on the fuel by the filter. Between this relaxation tank and the airplane fuel tank, most refueling systems would include a length of hose which could generate some additional charge.

From the outlet of the trifurcating joint to the receiving drum is inserted a 10-ft. piece of ⅜-in. carbon-steel pipe to simulate the velocity and electrical characteristics of a 2½-in. aviation hose which is used between a turbofuel servicer and an airplane tank.

Commercial filter elements were chosen for this test on the basis of filter material and included pleated paper, cellulose, and glass wool.

Two samples of JP-4 fuel were used having resistivities of 5×10^{11} ohm-cm. and 1 to 3 times 10^{13} ohm-cm., respectively. These values fall in the range generally considered to be the most hazardous from the standpoint of possible static discharges.

Fig. 9 presents some typical data obtained on the test setup. A pumping rate of 10 g.p.m. was used to give rated flow through the filter element. Graph 1, showing pipeline charge generation alone (bypassing the filter and relaxation tank), is presented for comparison with the second graph. Including the filter, as in Graph 2, results in a sharp increase in charge generation which far exceeds the pipeline generation.

Although partial relaxation occurs in sections **C** and **P**, substantial charge still reaches the receiver. Incidentally, the relaxation in **C** is higher than might be expected inasmuch as this section is oversized for the flow rates involved.

This section was necessary for piping connections and does not represent the usual arrangement in a normal aircraft-fueling system. When the main relaxation tank is added to the system, as shown in Graph 3, all the charge is removed before reaching the receiver.

Frequent arcing was observed around insulated flanges when the system was ungrounded. Potential differences at these points reached 5,000 to 10,000 volts before the arc fired. Sharp bends and a globe valve were also found to increase the rate of change separation appreciably.

The charge separation shown in Fig. 9 is for a single filter element. It

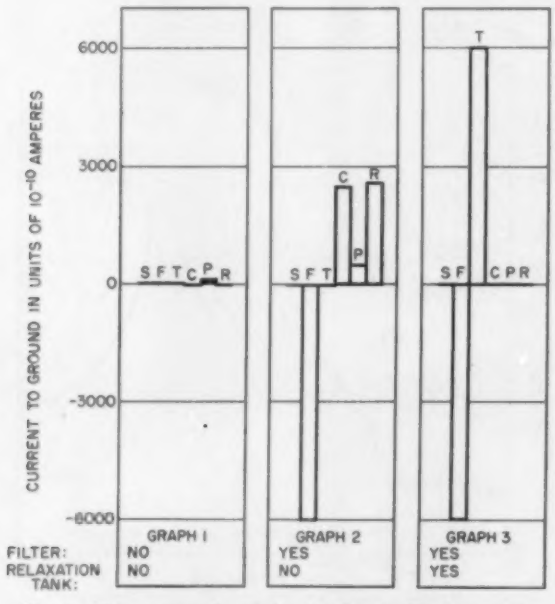


Fig. 9—Charge generation and relaxation in filter-test setup.

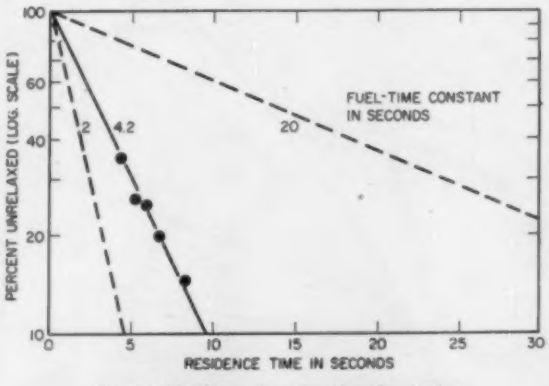
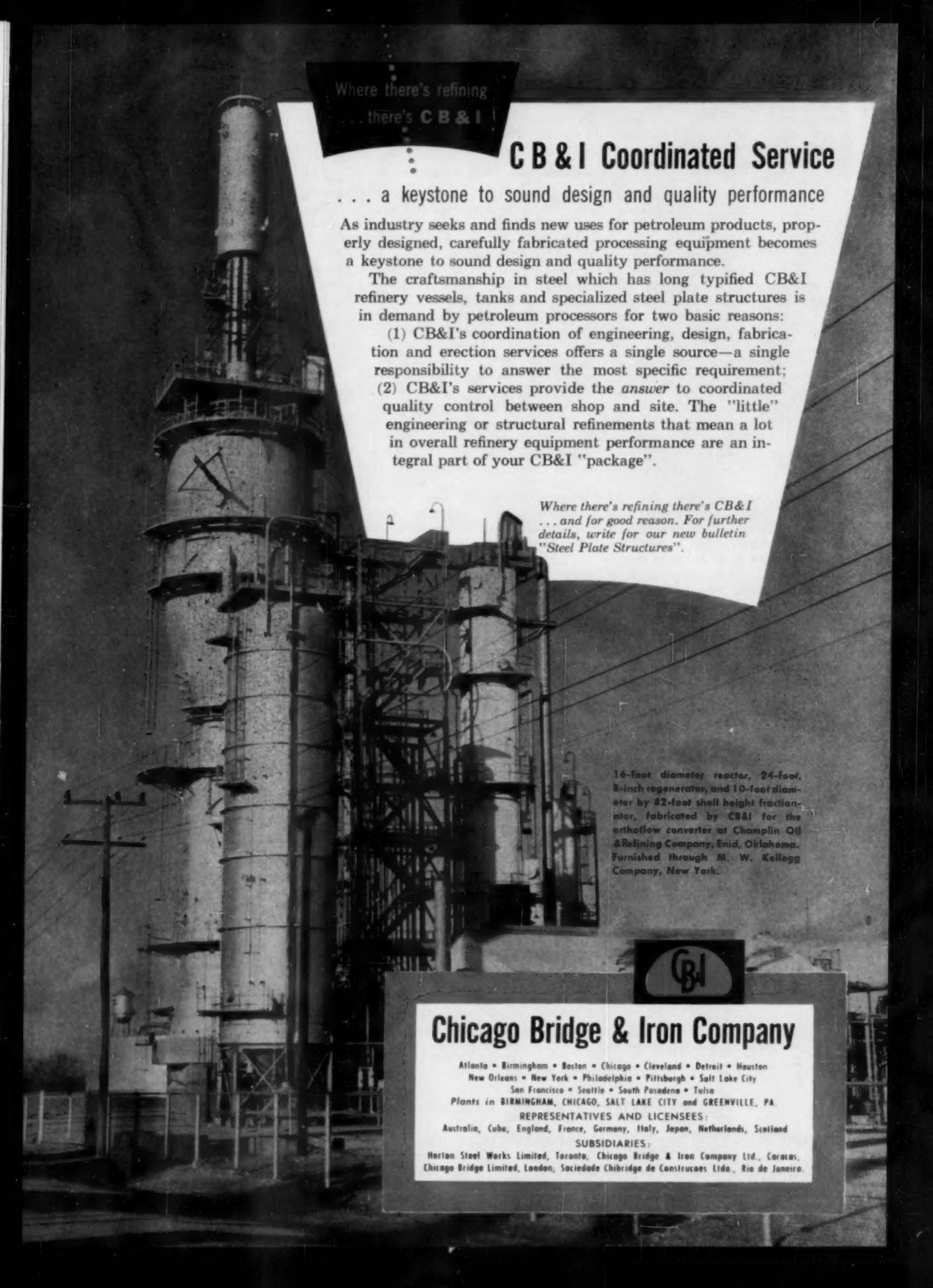


Fig. 10—Residence time in relaxation tank.



CB&I Coordinated Service

. . . a keystone to sound design and quality performance

As industry seeks and finds new uses for petroleum products, properly designed, carefully fabricated processing equipment becomes a keystone to sound design and quality performance.

The craftsmanship in steel which has long typified CB&I refinery vessels, tanks and specialized steel plate structures is in demand by petroleum processors for two basic reasons:

(1) CB&I's coordination of engineering, design, fabrication and erection services offers a single source—a single responsibility to answer the most specific requirement;

(2) CB&I's services provide the *answer* to coordinated quality control between shop and site. The "little" engineering or structural refinements that mean a lot in overall refinery equipment performance are an integral part of your CB&I "package".

Where there's refining there's CB&I . . . and for good reason. For further details, write for our new bulletin "Steel Plate Structures".

16-foot diameter reactor, 24-foot, 8-inch regenerator, and 10-foot diameter by 82-foot shell height fractionator, fabricated by CB&I for the orthoflow converter at Champlin Oil & Refining Company, Enid, Oklahoma. Furnished through M. W. Kellogg Company, New York.

CB&I

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

REPRESENTATIVES AND LICENSEES:
Australia, Cuba, England, France, Germany, Italy, Japan, Netherlands, Scotland

SUBSIDIARIES:
Horton Steel Works Limited, Toronto, Chicago Bridge & Iron Company Ltd., Caracas,
Chicago Bridge Limited, London, Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro.

would be multiplied by a factor of approximately 60 in a full-scale servicer having 60 parallel filter elements operating at the same flow rate per filter. Thus, very substantial charge could be produced.

Although the rate of relaxation of charge depends on the charge level and fuel time constant alone, the amount relaxed also depends on the time of residence in the relaxation tank. Fig. 10 shows the per cent of charge remaining for various residence times. The dashed-line curves showing time constants of 2 seconds and 20 seconds are based on theoretical calculations only. These time constants correspond to resistivities of approximately 10^{13} and 10^{14} ohm-cm., respectively.

The solid-line curve shows some experimental results obtained with fuel of 1 to 3 times 10^{13} ohm-cm. resistivity and a relaxation tank only 6 in. long. The results are in good agreement with theory.

Remaining charge versus residence time in the relaxation tank can be plotted as in Fig. 11. It will be seen that the maximum charge remaining after 30 seconds is 29 units (for a 10^{14} ohm-cm. fuel) compared to a maximum charge generation of 600 units (for a 10^{13} ohm-cm. fuel) with no residence time.

The resistivities of most JP-4 samples examined have fallen below 10^{14} ohm-cm. unless a high-voltage gradient is applied to the fuel. Thus, a tank of 30 seconds holdup time gives promise of removing the most dangerous part of the charge developed during filtration.

The proposed servicers for jet-fuel hydrant loading have two parallel systems each rated at 300 g.p.m. Two 150-gal. tanks to provide the 30 seconds residence time are of a size that could practically be added. Full-scale tests of such a system are planned.

Electrostatic-Field Measurement

Free electrostatic charge that has accumulated in a hydrocarbon standing in a storage vessel establishes an electrostatic field in the vapor space. If the vapor-dielectric strength (approximately 30,000 volts per cm.) is exceeded, a spark will occur possibly causing an explosion. Because the heart of the static hazard lies in the electrostatic field, measurement of the field strength is necessary. However, quantative electrostatic-field measurement is complicated by the distortion caused by any wires or leads running from the observer to a probe.

To overcome these and other difficulties, the engineering laboratory has developed a probe that will respond directly to the gradient of an electrostatic field in which it is placed. The reading of the probe is transmitted by a radio-telemetering system to avoid the need for any conductive path to the probe.

The operating principle of this probe is shown in Fig. 12. The flat vane is mounted on a rotatable shaft with counter-clockwise motion opposed by a spiral spring. In the absence of an electrostatic field the vane rests at a 30° inclination to the horizontal. When placed in an electrostatic field, charge separation is induced in the vane proportional to the electrostatic gradient. Most of the separated charges concentrate at the edges as shown.

The field exerts a force on these charges producing a net counter-clockwise torque on the vane proportional to the square of the gradient. Consequently, the vane rotates through an angle determined by the gradient of the electrostatic field. Mounted on the same shaft is a variable capacitor which is part of the circuit of a self-contained radio-frequency transistor oscillator.

Thus, the frequency of operation of the oscillator is changed according to the electrostatic-field gradient. This frequency change is picked up on a radio receiver at the tank roof thereby eliminating the need for a conductive connection to the probe.

The probe has been calibrated in an electrostatic field of known strength produced by a 100,000-volt power supply. It has a range of 2 to 6 kv. per cm. and can be extended upward by partial shielding. The first application will be made in a 10,000-gal. open-top tank being adapted for static-electricity studies.

Inert Gas Blanketing

In some cases where static buildup cannot as yet be satisfactorily controlled, inert-gas blanketing has been suggested to eliminate the explosive atmosphere. This aproach is particularly suited to the loading of tankers and barges, where floating roofs or relaxation tanks are impractical and low loading rates uneconomical. The Baton Rouge refinery of Esso has conducted tests and found CO_2 blanketing to be effective in dock operations.

The tests were performed in a 40-by-35-ft. refinery tank modified to simulate a vessel or barge compartment. Six-inch ells turned downward were used for introduction of the gaseous CO_2 and hydrocarbon loading. Five floats were distributed in the tank for vapor sampling. At the end of a run the floats were raised

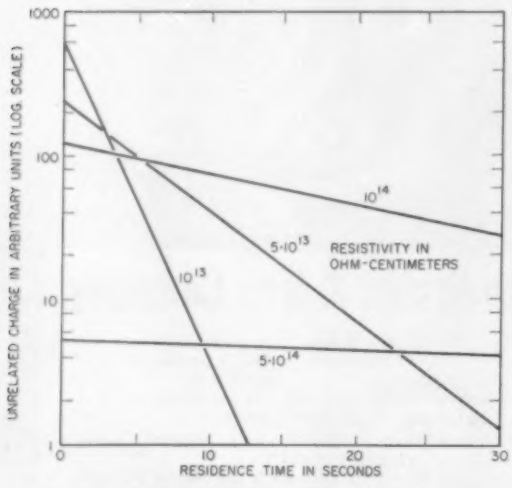


Fig. 11—Effect of resistivity on charge generation.

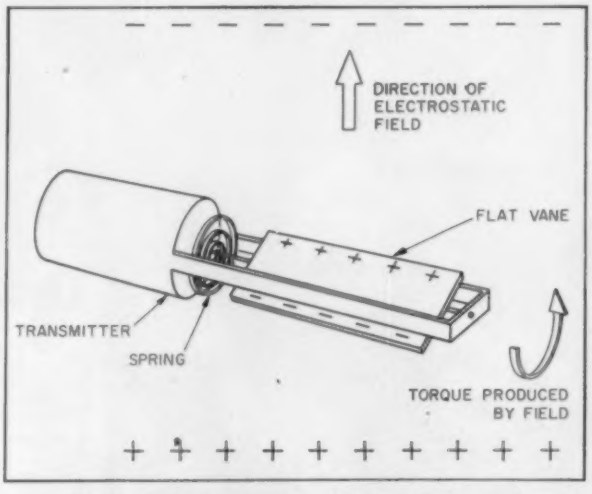
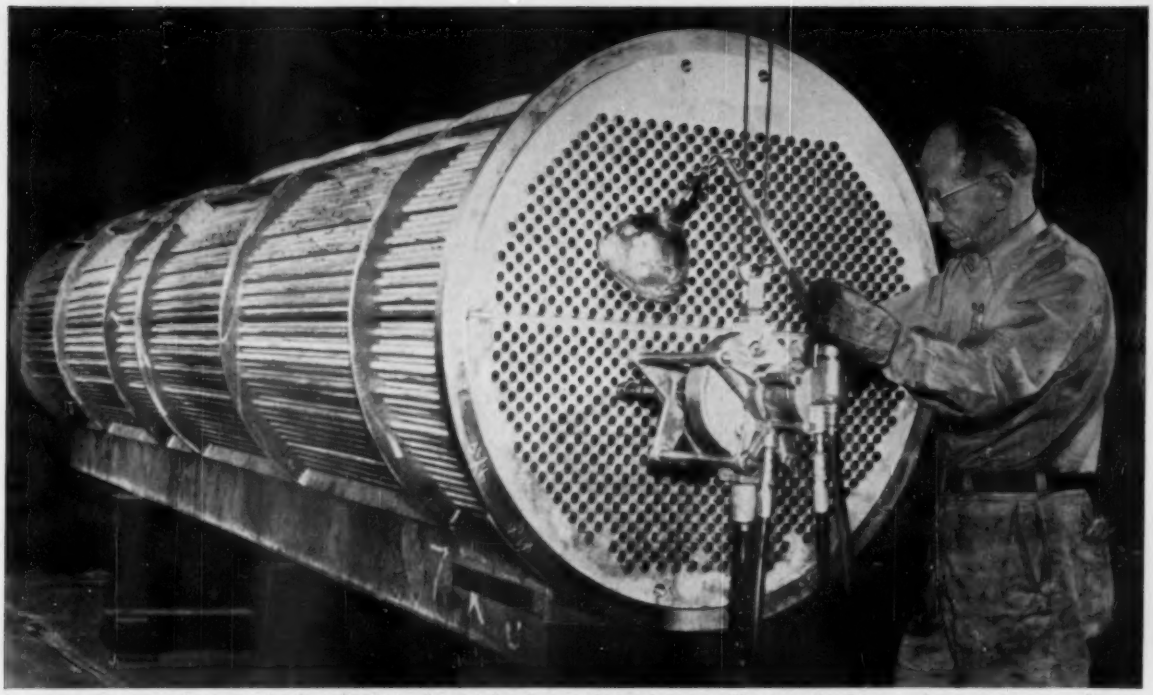
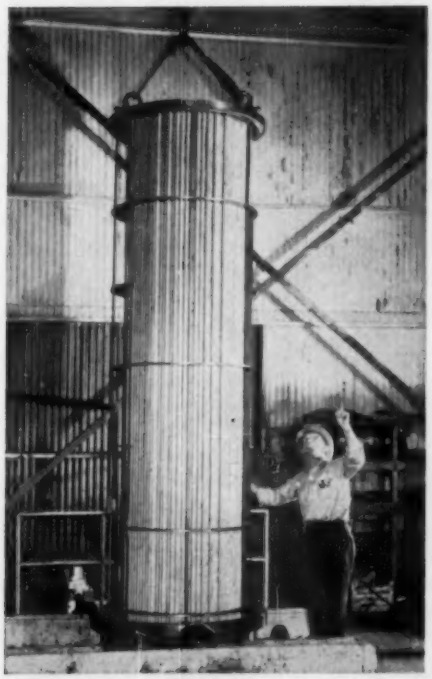


Fig. 12—Probe for measuring electrostatic-field strength.



EXPANDING ENDS of Arsenical Admiralty-439 tube in tube sheet with Southwestern Engineering Company's automatic expander.

SWECO Heat Exchangers for Gulf Coast refinery tubed with Anaconda Arsenical Admiralty-439 for long service life



SOUTHWESTERN ENGINEERING CO. used this vertical method of inserting removable tube bundles to help provide a better fit and to prevent binding.

For an expansion of the crude refinery plant of a major Gulf Coast refinery, Southwestern Engineering Co., of Los Angeles, Calif., recently built a variety of shell-and-tube heat exchangers, using a total of over 110,000 lbs. of Anaconda Arsenical Admiralty-439 tube.

Anaconda Arsenical Admiralty-439 was selected, according to Southwestern Engineering, because it offers appreciably longer service life than ferrous tube for the type of cooling water involved.

Among the heat exchangers involved are top-tray reflux coolers, each with 978 tubes, ¾" O.D., 16 gage, 20' long. Each bundle has about 3800 sq. ft. of surface. Another typical unit is the fractionator overhead condenser with 1021 tubes for a total of 6400 sq. ft. of surface. Other equipment includes a debutanizer bottoms-feed exchanger, naphtha splitter reboiler and overhead condenser, as well as an amine-solution exchanger and reactivator reboiler.

FULL RANGE. Anaconda Condenser Tubes are made for all sizes and kinds of shell-and-tube, submerged, spray-tower, and finned-atmospheric heat transfer equipment—for operation at elevated temperatures in conformance with ASME standards for allowable stresses.

TECHNICAL ASSISTANCE. Our Technical Department is regularly helping companies select the correct tube alloy. This service is available to you without obligation. Write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

3789

ANACONDA®

TUBES and PLATES for CONDENSERS and HEAT EXCHANGERS

Made by **THE AMERICAN BRASS COMPANY**

to obtain a sample profile versus height.

The vapor-sampling system included a combustible gas sampler and analyzer with eight sample points and an oxygen analyzer. One roof nozzle was provided with a steam syphon to evacuate the CO_2 after completion of a test and another was fitted with a floodlight for visual examination.

In the first set of tests, from 425 to 1,000 lb. of gaseous CO_2 was loaded at rates ranging from 2,840 to 5,100 lb. per hour. During each test the oxygen content at the various sampling locations was analyzed. The results of these tests are summarized in Table 4 and Figs. 13 and 14. The target of protection was taken to be 10 per cent oxygen giving a realistic safety factor below the actual limit of protection of 14 per cent. From the data obtained in the tests, the following findings can be stated:

1. The formation of a protective blanket by the stratification of CO_2 is possible. Complete coverage of the tank bottom occurs rapidly.

2. Within the range covered by the tests, the blanket height and minimum oxygen reading are directly proportional to the quantity of CO_2 and inversely proportional to the CO_2 loading rate. See Figs. 13 and 14.

3. Approximately 0.4 lb. of CO_2 is required per square foot of tank bottom. At a rate of 4,000 lb. per hour, 500 lb. of CO_2 produced a 4-ft protective blanket in the test tank having

TABLE 4—BLANKETING EFFECT OF GASEOUS CARBON DIOXIDE

Quanity of CO_2 (lb.)	Rate of CO_2 addition (lb.) per hour)	Thickness of protective blanket* (ft.)	Minimum per cent oxygen		Per cent oxygen 15 minutes after CO_2 off	
			1 Ft. from bottom	2 Ft. from bottom	1 Ft. from bottom	2 Ft. from bottom
650	3,900	5.5	8.5	9.7	8.6	9.8
680	5,100	3.0	9.8	10.9	10.0	11.0
425	3,000	1.6	9.8	10.5	10.3	10.9
700	3,000	6.4	5.3	5.4	5.7	5.8
900	2,840	6.4	5.8	6.0	7.0	7.2
500	3,160	3.6	7.4	7.6	7.7	7.7
900	4,000	7.4	7.6	7.6	7.8	7.9
700	3,650	5.5	8.3	8.3	8.8	9.0
900	3,940	8.4	6.8	6.7	7.2	7.2
1,000	5,000	8.4	7.2	7.3	7.6	7.8
700	4,650	5.8	8.5	8.8	9.1	9.3
700	4,940	5.0	7.7	7.9	7.9	8.2

* Reduction of oxygen to 10 per cent.

less than 10 per cent of oxygen. The blanket height was about 1.1 times the equivalent height of the volume of CO_2 added.

In addition to the sampling procedure described herein, gas samples at the top of the tank were obtained for Orsat analysis during various phases of the CO_2 loading operation and dissipation period. No appreciable increase in CO_2 concentration at the roof nozzles was detected.

Once a compartment is inerted, the fuel must be loaded in such manner that the blanket is not disrupted. A series of tests loading diesel oil into the blanketed tank were made to establish the optimum balance between high loading rate and blanket maintenance.

In some tests the tank was dry, and in other tests hydrocarbon was gravitated into the tank before pumping. Results are summarized in Table 5 and Fig. 15. From the data obtained the following findings can be stated:

1. When the tank is nearly empty, maintenance of protection is inversely proportional to hydrocarbon pumping rate. Below approximately 3,500 bbl. per hour there was little blanket dispersion. The increase in oxygen concentration did not exceed 2 to 3 per cent in the first 10 minutes of pumping at these rates. At higher rates the blanket was dispelled in only a few minutes with a low hydrocarbon level (below 2 ft.) in the tank.

2. After a 2-ft. hydrocarbon level was established at low rates, a protective blanket could be maintained for several hours at pumping rates up to 15 ft. per second.

It appears that dissipation of the

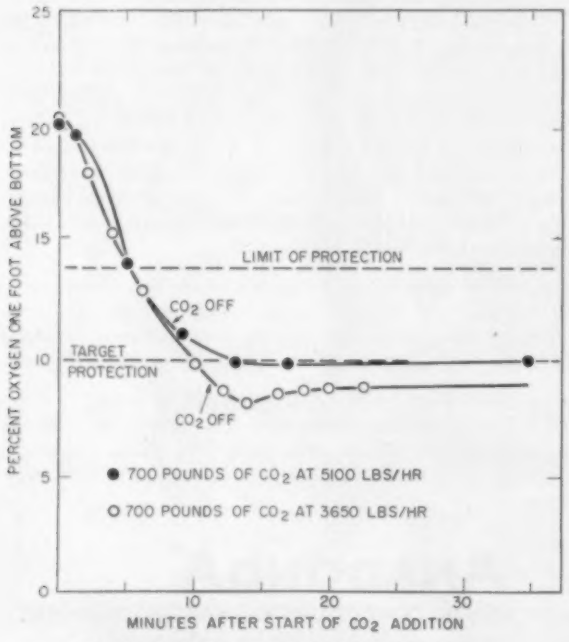

PERCENT OXYGEN ONE FOOT ABOVE BOTTOM
MINUTES AFTER START OF CO_2 ADDITION
LIMIT OF PROTECTION
TARGET PROTECTION
CO_2 OFF
CO_2 OFF
● 700 POUNDS OF CO_2 AT 5100 LBS/HR
○ 700 POUNDS OF CO_2 AT 3650 LBS/HR

Fig. 13—Blanketing with C_3O during inerting.

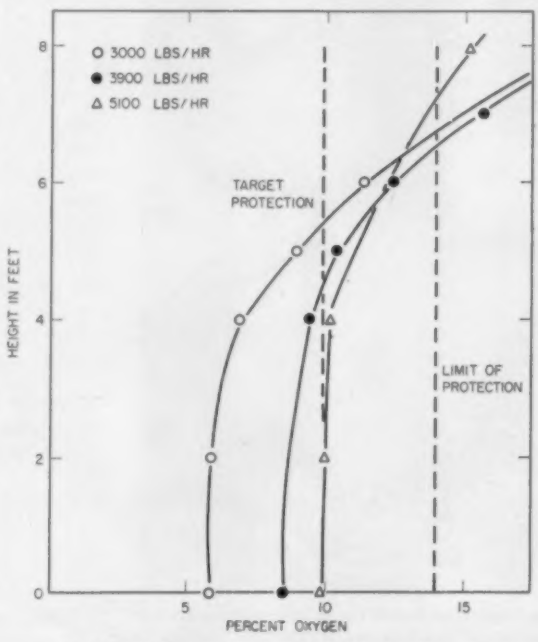


Fig. 14—Blanket profile at various CO_2 loading rates.

Facts on Visco® CORROSION PREVENTION

Here are facts on Visco Corrosion Inhibitor costs in a wide variety of producing oil and gas wells—probably some near you . . . or with corrosion problems like yours. At every well, Visco treatment is only a small fraction of the cost of corrosion damage in untreated wells.

WELL TYPE	WELL LOCATION	DAILY PRODUCTION			Frequency of Visco Treatment	Cost of Visco Treatment per bbl of produced fluid
		Oil bbls	Water bbls	Gas MCF		
Pumping	East Texas	40	300	—	3 times a week	.13¢
Pumping	Eastern Kansas	2	492	—	Once a week	.03¢
Flowing	West Texas	20	6.3	—	Twice a week	.22¢
Pumping	Northern Kansas	10	70	—	Once a day	.62¢
Gas Lift	West Texas	20	20	—	Once a day	2.8¢
Pumping	North Texas	—	2000	—	Once a day	.16¢
Pumping	Eastern Kansas	—	250	—	Twice a week	.11¢
Flowing	East Texas	51	155	1	Once a day	.28¢
Flowing	West Texas	420	—	—	Twice a week	.13¢
Gas	East Texas	25	Trace	22.9	Twice a week	4.64*
Pumping	West Texas	420	210	—	Every other day	.14¢
Pumping	West Texas	441	441	—	Every other day	.052¢
Gas	Northern La.	—	—	23.4	Once a day	2.42¢*
Pumping	Eastern Kansas	—	250	—	Once a day	.15¢
Pumping	Kansas	100	948	—	Twice a week	.13¢
Gas	Louisiana	9.2	Trace	300	2 Sticks every other day	.66¢*
Pumping	East Texas	46	176	0.92	Once a day	.27¢
Pumping	East Texas	51	155	1.0	Once a day	.28¢
Pumping	East Texas	20	400	—	Three times a week	.12¢
Pumping	Eastern Kansas	2.5	276	—	Once a week	.09¢

*Cost in cents per million cubic feet.

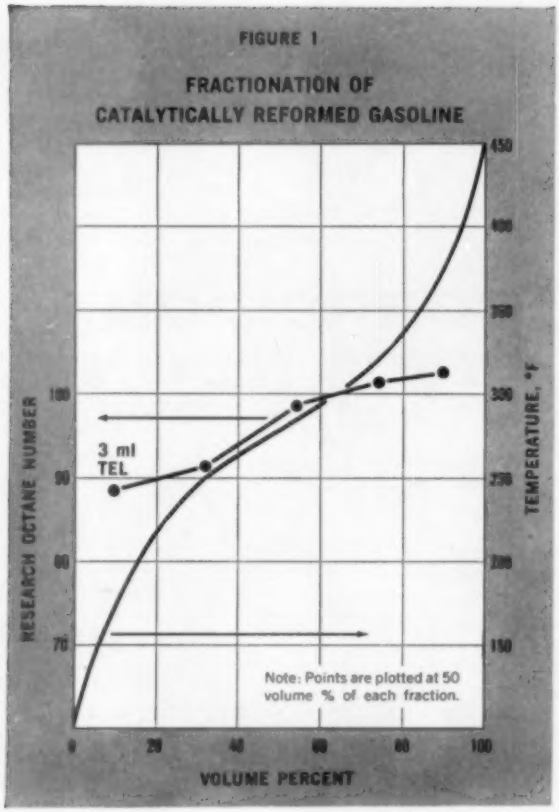
Stick type treatment is easily applied through simple fitting added to well head.

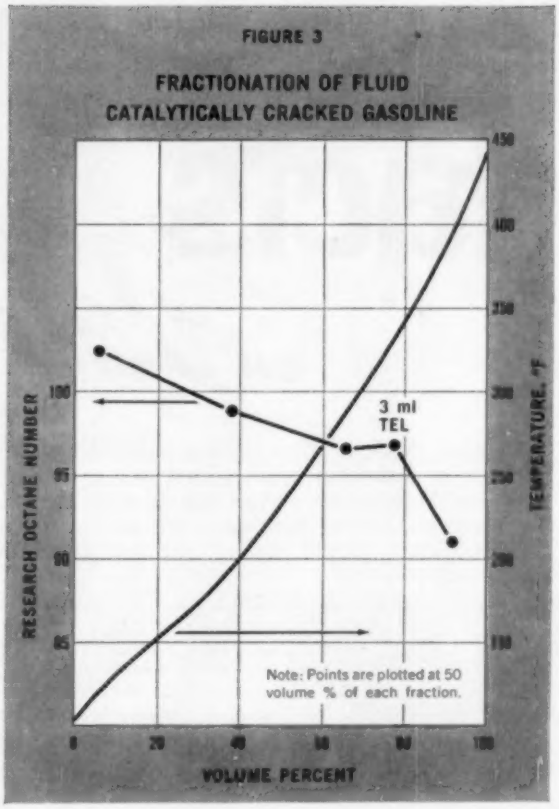
Some producers mount a pump and tank of inhibitor on a small truck, make a regular circuit of leases to pump inhibitor into their wells.

For fast action on a sound, money-saving approach to your downhole corrosion problems, call Houston, JAckson 8-2495, or contact your Visco Field Service Man.

VISCO PRODUCTS COMPANY
INCORPORATED
1020 Holcombe Blvd. • Houston 25, Texas

Visco . . . CONSISTENTLY EFFICIENT OIL INDUSTRY CHEMICALS





Ethyl's Octane Profiles Help Refiners Achieve More Economic Octane Numbers

FRACTIONATION of a reformate or cracked stock and an analysis of the cuts for octane and other inspection qualities by Ethyl Research Laboratories yield data that can be a very valuable tool for refiners in their continuous efforts to improve gasoline quality.

These data, referred to as "octane profiles," can be used as design bases for splitting both catalytically cracked and catalytically reformed gasolines. Such information is particularly valuable when refiners are planning how to use blending components most efficiently and economically in the production of 100 Research octane fuels.

Advantages of Splitting Reformate Are The Same As for Cracked Stock

Splitting catalytically cracked and catalytically reformed gasoline at the refinery into light and heavy fractions offers the following advantages:

1. no loss in yield
2. improves premium octane quality at low capital investment and low operating costs
3. segregates components of high anti-knock quality
4. balances premium and regular grade volatility
5. permits a milder reforming level for a given premium octane requirement with resulting yield advantage

of the fuel over the ranges fractionated.

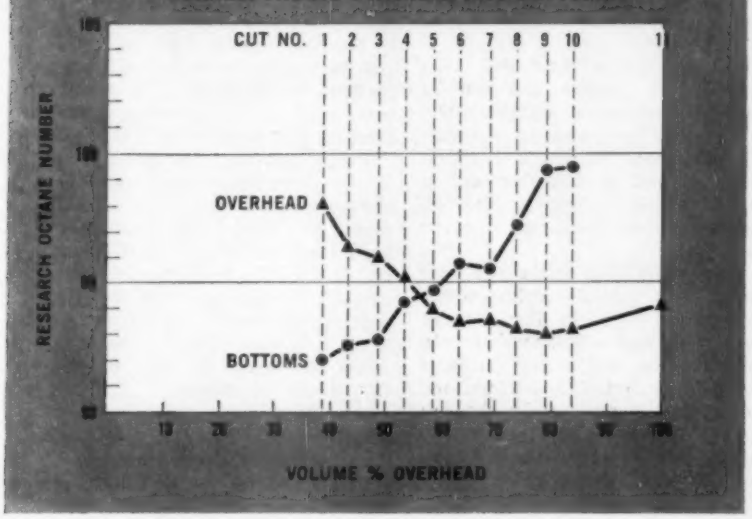
Engineers from Ethyl's Refinery Technology Group can recombine these cuts stepwise to develop a relationship as indicated below in Figure 2. This chart shows the quantity of stock that can be recombined to satisfy any given Research octane requirement.

A comparison of Figures 1 and 3 shows how catalytically cracked stocks can be handled in conjunction with catalytically reformed stocks to gain premium octane quality with balanced volatility.

The lower boiling portion of the catalytically cracked stock is combined with the higher boiling portion of the reformate. Then the remainders can be combined for use in regular grade fuel.

FIGURE 2

CALCULATED RESEARCH OCTANE NUMBERS OF CORRESPONDING OVERHEAD AND BOTTOMS



Product splitting can be a very economical way to gain additional octane quality in premium gasoline.

Reformate and Cracked Stock Cuts Can Be Recombined To Satisfy The Need for Higher Research Octane Number

Typical data for an octane profile of a reformate are shown in Figure 1.

Fractionation of the fuel that is under study into narrow cuts can be made on either a volume basis or a boiling range basis. Each cut then is subjected to a complete laboratory inspection in order to obtain the distribution of the properties

Blend 100 RON Fuels from 97 RON Base Stocks

Using data contained in an octane profile, and with the help of Ethyl Refinery Technologists, one refiner found he could produce a 100 RON blending stock (at 3.0 ml TEL/gal.) from 50 per cent of his 96 RON catalytic reformate (at 3.0 ml TEL/gal.).

Another refiner was shown that 45 per cent of his 97 RON catalytically cracked gasoline (at 3.0 ml TEL/gal.) rated in excess of 100 RON (at 3.0 ml TEL/gal.).

So, from stocks rating no higher than 97 RON, a refiner can selectively blend 100 RON gasoline yet satisfy volatility and other critical test requirements.

How Ethyl Research is helping you

Ethyl Research Laboratories in Detroit can help you evaluate the best cut points for your particular stocks.

The fractionating equipment available for this work includes 1-inch and 4-inch Oldershaw columns, 1-inch and 2-inch packed columns, and 1-barrel and 3-barrel stills.

These facilities for the close fractionation of gasoline and the services of Ethyl's Refinery Technology Group are available through your Ethyl Representative for many different kinds of studies.

These studies may include evaluation of reformer charge stocks, development of selective blending data for special boiling-range fuels, or any similar investigations you need.

ETHYL CORPORATION
New York 17, N. Y.

RESEARCH LABORATORIES:
1600 W. Eight Mile Road, Ferndale 20, Mich.
2600 Cajon Road, San Bernardino, Calif.

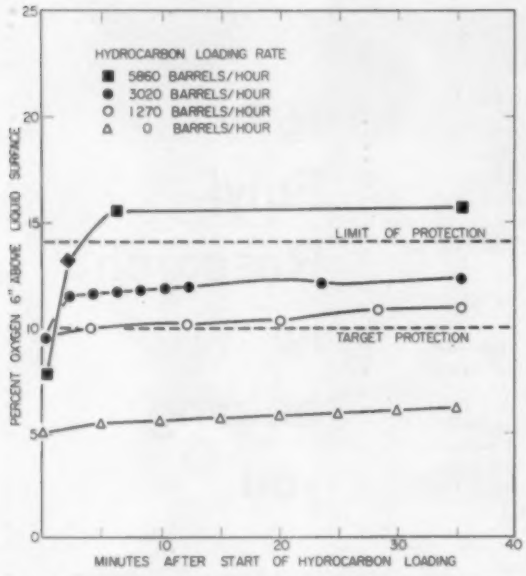


Fig. 15—Maintenance of blanket during hydrocarbon loading.

"Free electrostatic charge that has accumulated in a hydrocarbon standing in a storage vessel establishes an electrostatic field in the vapor space. If the vapor-dielectric strength (approximately 30,000 volts per cm.) is exceeded, a spark will occur, possibly causing an explosion."

blanket is a function of the hydrocarbon discharge velocity and height of the spray at start of loading with the geometry of the loading area having a significant effect on the splash characteristics obtained. Protection will probably be maintained if (1) the spray height is less than the thickness of the blanket; and, (2) discharge velocities do not exceed 15 ft. per second.

In addition to pressuring gaseous CO_2 into the compartments, the alternate procedure of dumping in solid dry ice, which would then sublime, has been considered. This method has the advantage of continuous evolution of CO_2 gas from the dry ice not sublimed at the start of loading.

However, tests indicated that much time is required to produce sufficient inerting before hydrocarbon loading. Furthermore, the transporting of dry ice would be difficult inasmuch as trucks could not be driven on the dock.

The use of inert gas rather than CO_2 was also considered but offered no advantages.

The test data show that CO_2 blanketing is possible and can be utilized in dock operations. These data can be used in evaluating the cost of a permanent installation for CO_2 blanketing and in designing such a system. In utilizing the test findings, however, certain limitations must be recognized.

The loading lines in the test were standard 6-in. pipe, although most vessel lines are 10 in. in diameter, discharging through a bellmouth nozzle. This variation will affect discharge velocities for both CO_2 addition and hydrocarbon pumpings. In the test tank there were more openings in the roof than normally found in vessel and barge compartments.

TABLE 5—HYDROCARBON PUMPING INTO BLANKETED TANK

Depth of gravitated hydrocarbon (ft.)	Pumping rate (bb'ls. per hour)	No. of nozzles utilized	Per cent oxygen at start of pumping		Per cent oxygen 30 minutes after start	
			1 Ft. from bottom	2 Ft. from bottom	6 In. above liquid	18 In. above liquid
	1,270	1	9.5	10.5	11.2	11.5
	5,360	1	8.0	8.8	15.2	15.8
1.0	2,720	1	9.8	10.9	11.2	12.3
	3,680	1	8.2	8.0	16.7	16.5
2.3	4,400	1	7.0	6.6	8.3	8.0
1.9	4,910	1	7.2	7.2	8.6	8.6
	4,820	1	8.4	8.4	18.2	18.2
1.6	4,200	1	9.0	9.0	9.2	9.5
	1,970	1	7.8	7.9	8.6	8.7
	2,020	1	8.8	8.9	10.4	10.4
	3,020	1	9.5	9.6	12.4	12.4
	3,500	2	7.7	7.7	8.4	8.4
0.6	3,200	2	9.5	9.5	10.2	10.0
	6,000	2	8.8	8.7	11.6	11.7

Liquid CO_2 converters are available in sizes up to 20 tons in capacity and can be designed for the rate of conversion which appears most suitable for the dock operations. They will produce gaseous CO_2 free of liquid droplets and ice particles. Converters are available at no cost for large volume users.

The converter drum is serviced at its permanent site by trucks of the vendor. Investment costs for the user would include piping from the drum to the dock berths, flow controllers, and the pad and necessary utility connections for the drum. The principal cost involved in operating a dock blanketing system is the CO_2.

Utility costs for this system would be negligible; maintenance and depreciation costs would also be relatively small. A typical barge compartment has a floor area of 640 sq. ft. Assuming that a 4-ft. protective blanket is necessary, based upon the test findings approximately 4.0/1.1 or 3.64 ft. of CO_2 would have to be added. About 2,300 cu. ft. or 270 lb. of CO_2 would be required.

At $70 per ton, this would cost approximately $10. The CO_2 alone, therefore, would increase costs by approximately 0.83 cent per barrel, assuming a 1,200-bbl. compartment. The center compartment on a T-2 tanker has a capacity of approximately 8,000 bbl. and floor area of 1,280 sq. ft.

Based upon calculations similar to those outlined herein, CO_2 costs would amount to approximately $20 for a compartment or 0.25 cent per barrel. In both of these cases other applicable costs must be added.

Bibliography

1. "Static Electrification," Supplement No. 2, Brit. J. Appl. Phys. (1953).
2. S. S. Mackeown and Victor Wouk, "Electrical Charges Produced by Flowing Gasoline," Ind. Eng. Chem. 34 (6) 659-64, June (1942).
3. "Static Electricity," (NFPA No. 77-1950) National Fire Codes, National Fire Protection Assoc., Boston, 5, 1-50 (1957).

"So I says, 'If it's a Christmas Tree... I'll decorate it...'"

The naive young man may not know a Christmas tree from a Christmas tree . . but here's something you can bet on: veteran Joe Roughneck, symbolic figure of the fabulous oil industry, knows everything about everything concerned with drilling for and producing oil . .

Whether Joe is rendering rugged service on a rig . . or whether he's the brain of a big company . . he knows the kind of quality pipe it takes. More, he knows Lone Star makes it . . and will deliver it on the double! Depend on Lone Star API casing, tubing, and line pipe.

Neighbor, wherever you are, MERRY CHRISTMAS

Lone Star STEEL COMPANY

EXECUTIVE SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

How to figure

How much air to put down the hole

. . . in air drilling

By J. O. Scott

DURING air drilling, enough air must be circulated to blow the cuttings out of the hole readily. When the volume is adequate, the hole will stay clean and cuttings will not accumulate when the circulation is suspended.

Possible hole irregularity makes it hard to calculate air velocities accurately. However, a velocity of about 3,000 ft. per minute at atmospheric conditions has been found to be about the minimum for effective hole cleaning. The charts presented here show air volume and pressure requirements when the minimum lifting power of the air in the hole is equivalent to 3,000 ft. per minute of atmospheric air. Effects of friction are included.

Lifting power . . . The ability of air to lift cuttings is proportional to its density and its velocity squared.[1] But both the density and velocity of the air change as it passes up the hole. Because the air is compressible it expands as it rises from the higher pressure at the bottom of the hole. Thus density decreases and velocity increases as the air rises.

At constant temperature the air density is proportional to pressure and its velocity is inversely proportional to pressure. Because the lifting power increases as the velocity squared, maximum lift will occur at the top of the hole and minimum lift at the bottom of the drill pipe.

Minimum velocity . . . Because of the higher pressure, a lower velocity is required at the bottom of the drill pipe to give the lifting power of 3,000 ft. per minute of atmospheric air. This is found by equating the lifting power at the two conditions:

$$\rho_b (v_b)^2 = \rho_a (v_a)^2 \text{ or}$$

$$P_b (v_b)^2 = P_a (v_a)^2$$

$$(v_b) = (14.7 \times 144/P_b)^{0.5} (50) \quad (1)$$

where P_b is in lb./ft.^{2} absolute and v_b is feet per second.

Bottom-hole pressure . . . An energy balance written for the flowing vertical column of air can be used to find bottom-hole and circulating pressures. This is:

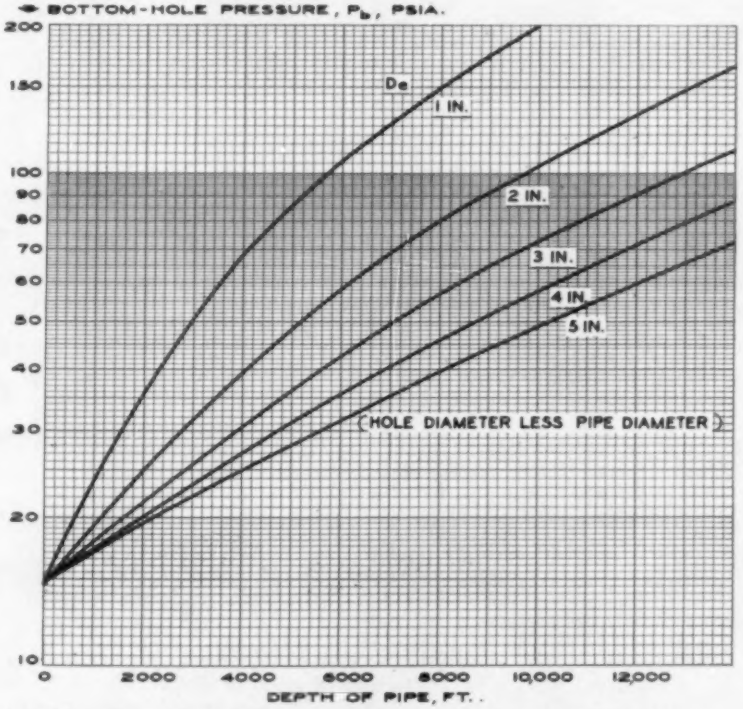
$$VdP + dL + \frac{vdv}{g} + \frac{2f\,v^2\,dL}{gD_e} = 0 \quad (2)$$

where:

V = air volume, ft.^{3}/lb.
P = pressure, lb./ft.^{2}
v = velocity, ft./sec.
g = gravitational constant, 32.2 ft./sec.^{2}
f = dimension less friction factor.
L = depth, ft.
D_e = effective diameter, ft.

The kinetic-energy term vdv/g may be neglected since it is very small for the flow of air. If air is assumed to behave as an ideal gas and flow is essentially isothermal* Equation 2 may be modified to contain only pressure

*Even when flow is adiabatic rather than isothermal results will be practically the same.[2] For an ideal gas an irreversible adiabatic expansion is also isothermal.



BOTTOM-HOLE AIR PRESSURE in the annulus between hole and drill pipe when minimum lifting capacity is equivalent to 3,000 ft. per minute of free air. Fig. 1.

Author was formerly district editor of the Journal. He is now associated with Cities Service Research & Development Co.

AIR REQUIRED to maintain a minimum lifting capacity equivalent to 3,000 ft. per minute of atmosphere air in the annulus between the drill pipe and borehole. Fig. 2.

and length as variables. This may then be integrated between limits for flow up the hole.

$$V = RT/MP$$

$$\frac{2fv^2}{gD_e} = \frac{2fG^2R^2T^2}{gD_eM^2P^2} = \frac{B}{P^2}$$

$$dL = -\frac{RTPdP}{M(B + P^2)}$$

$$L = \frac{RT}{2M} \ln \frac{P_b^2 + B}{P_a^2 + B} \qquad (3)$$

where:

G = mass velocity, lb./sec.-ft.^{2}

R = gas constant, 1,544 ft.-lb./mole-°R.

T = average absolute temperature, °R.

M = molecular weight, 29.

D_e = difference in hole and pipe diameters.

P_a = atmospheric pressure.

P_b = bottom-hole pressure.

For the special case where the minimum lifting power of the air equals that of 3,000 ft. per minute of free air, the minimum mass velocity, G, is v_bP_bM/RT where v_b is expressed by Equation 1. When this value of G is substituted in Equation 3, bottom-hole pressure, P_b, may be solved as a function of depth, L. This relationship is shown in Fig. 1.

In determining Fig. 1, a constant friction factor was used. With the range of circulation rates used in air drilling, flow is always turbulent and at high roughness values friction factor is constant. A relative roughness of 0.004 was used. This is within the range normally used for concrete. Average temperature was assumed to be 100° F.

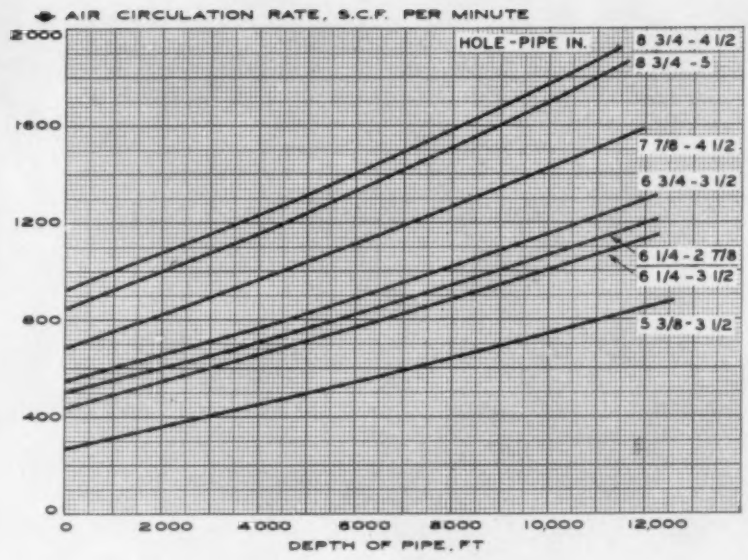
Volume required . . . Mass velocity, G, required to produce a minimum lifting capacity equivalent to 3,000 ft. per minute of free air gives directly the volume rate of air needed. This is found by the expression:

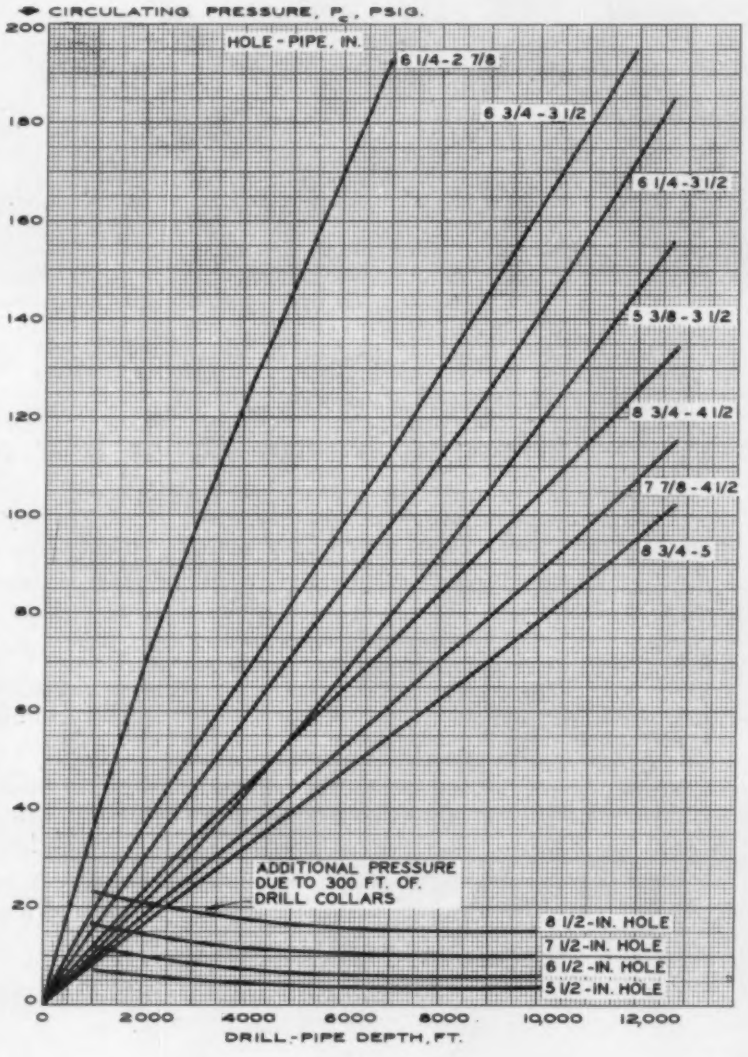
$$Q = GART_o/MP_o \qquad (4)$$

where:

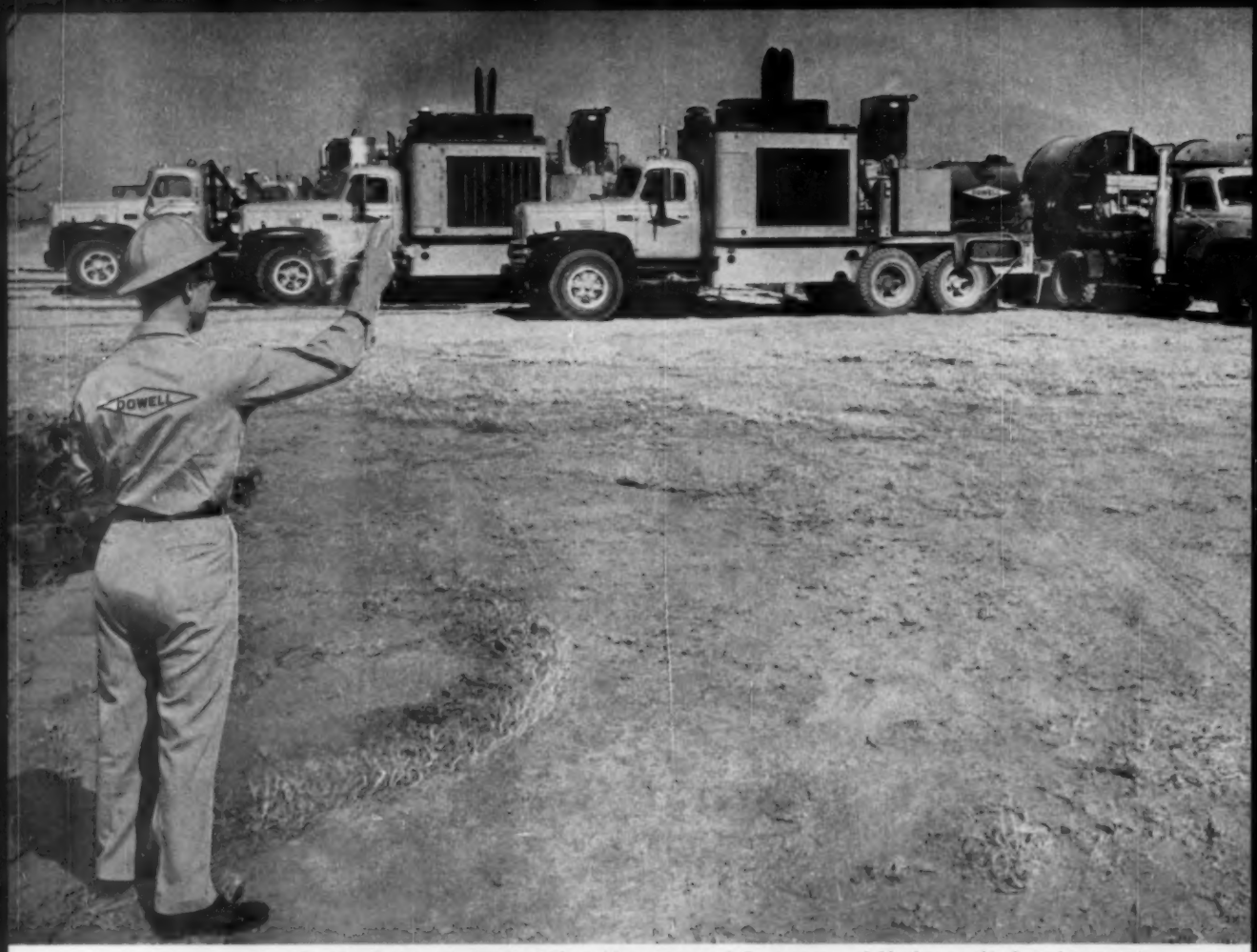
Q = volume rate, std. cu. ft. per second.

A = cross-sectional area of annulus, ft.^{2}





PRESSURE REQUIRED to circulate air around a drill string of single size drill pipe when minimum annulus lifting power is equivalent of atmosphere air. Fig. 3.



The Dowell engineer's signals coordinate the operation of the pumpers and blenders on this fracturing treatment.

PETROJEL

Effective fracturing at low cost for quick payout

Petrojel* uses your own lease crude, modified on location with a gelling agent to give it high sand-carrying capacity. The result is an effective, low-cost fracturing fluid designed for quick payout. When crude oil is not available, kerosene or diesel fuel may be used.

The gelled crude has lower surface tension than the original base oil. It does not lose its viscosity when it is pumped through sand, and it has naturally low fluid loss. Thus, Petrojel gives you the full benefit of deep sand penetration plus easier return of the fluid after treatment.

The fluid used in Petrojel resists thinning at temperatures up to 200° F., making it especially effective in high-temperature wells. It is also an ideal treatment for gas wells or oil wells with low bottom-hole pressures.

Regardless of the treatment your well requires, you can depend on Dowell's research facilities, experienced personnel and advanced equipment to give you the best results.

For more information, or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service, or write to Dowell Incorporated, Tulsa 1, Oklahoma.

*Service Mark of Dowell Incorporated

Services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

T_o and P_o = standard temperature and pressure.

Another way to find Q is to first find Q_o the amount of air needed at zero depth. This is given by 50 × A—velocity times area. Q is related to Q_o by $Q = Q_o (P_b/P_o)^{0.5}$.

Fig. 2 shows required volumetric flow rates for a number of different hole and drill-pipe combinations. The depth shown is for the length of drill pipe, not total hole depth. Generally, the annular area around the drill collars will be less than around the pipe.

Pressure required . . . To find the circulating pressure at the entrance to the drill string, Equation 2 may be integrated for downward flow. The result is:

$$L = \frac{RT}{2M} \ln \frac{P_b^2 - B}{P_c^2 - B} \quad (5)$$

In this case B is the same as in Equation 3 except that a friction factor for commercial pipe is used and D_e is the internal diameter of the pipe.

By assuming that the drill string consists only of drill pipe, Equations 3 and 5 may be solved simultaneously to give circulating pressure, P_c, in terms of bottom-hole pressure, P_b. Using Fig. 1, P_c is then found as a function of L for the condition of minimum lifting capacity of 3,000 ft. per minute of free air. The result for a number of drill-string and hole-size combinations is shown in Fig. 3.

Fig. 3 shows that for practical purposes, the circulating pressure varies linearly with depth when the minimum cuttings-lifting condition is met.

Fig. 3 only approximates compressor pressure required for air drilling. Compressor pressure will be higher than P_c because of added pressure losses in the surface connections, standpipe, kelly, drill collars and bit. The magnitude of pressure increase due to drill collars is shown in the lower part of Fig. 3.

Conditions assumed for the curves in the lower part of Fig. 3 are 300 ft. of drill collars with an internal diameter of 2.75 in. and a difference of 1 in. between the hole diameter and the outside diameter of the drill collars.

An important point to consider is that Figs. 2 and 3 show volume and pressure requirements when the hole is dry. When the hole is producing water, higher volumes and pressures will be required to air drill efficiently.

References

1. Brown, G. G., et al., Unit Operations, p. 73.
2. Dodge, B. F., Chemical Engineering Thermodynamics, p. 351.

Can These Super-Hard Ball Valves Correct Your Pump Trouble?

If you have troublesome wells on your lease . . . wells that are hard to keep pumps in due to corrosive or abrasive fluids . . . and if the cause of your pump trouble is in the valves . . . the next time you're in your supply store ask them to show you a set of DuMore® Balls and Seats.

DuMore is a super-hard alloy composition that affords the highest resistance to wear caused by sand cutting, corrosion, or ball pounding. DuMore Balls and Seats are non-magnetic, they are corrosion-proof, and they run especially well in sour or sweet crudes, hydrogen sulphide gas, or salt water brine.

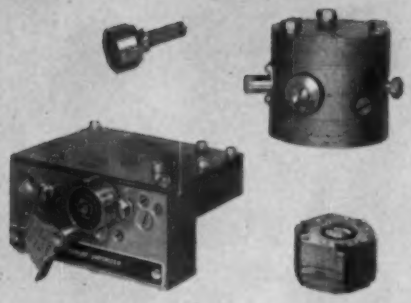
Considering its unusual metallurgical properties (an alloy of chromium, cobalt, and tungsten), it's a bargain at any price . . . yet DuMore costs less than premium grade ball valves. Moreover, the expenses you would eliminate in one pulling job alone would more than pay for fitting out your pump with DuMore Balls and Seats.

Try DuMore the next time you run a pump. You will be more than satisfied with the service they will give you, and you will agree that it's the "Best Ball and Seat in the Oil Patch."

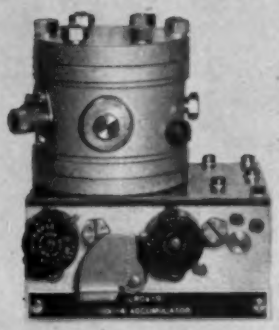
DuMore® Balls and Seats

Made by **Harbison-Fischer • Fort Worth**

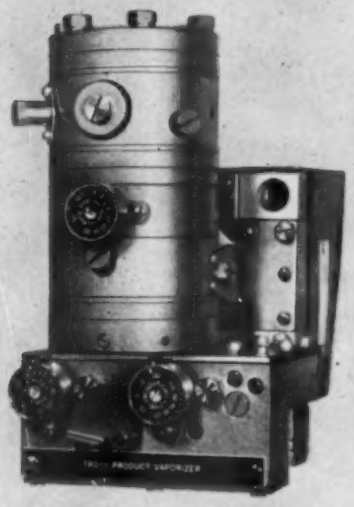
"Best Balls and Seats in the Oil Patch"



Easily disassembled—Unitized construction of all controller components simplifies maintenance . . . makes reassembly foolproof. No need to dismantle stack to clean pilot assembly.

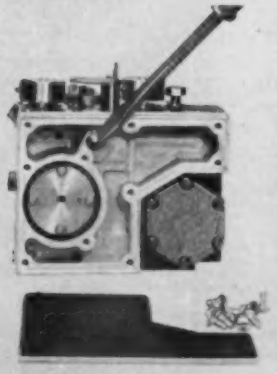


Easy accessibility—All adjustments, filters, and restrictions are easily reached on the face of the controller. Control action is reversed by turning reversing plate 90 degrees.

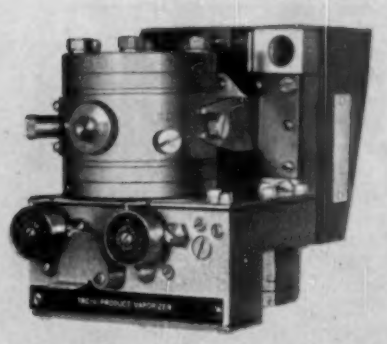


Rate action easily added—Add rate action simply by removing deviation section, inserting longer studs and rate unit, and replacing deviation section.

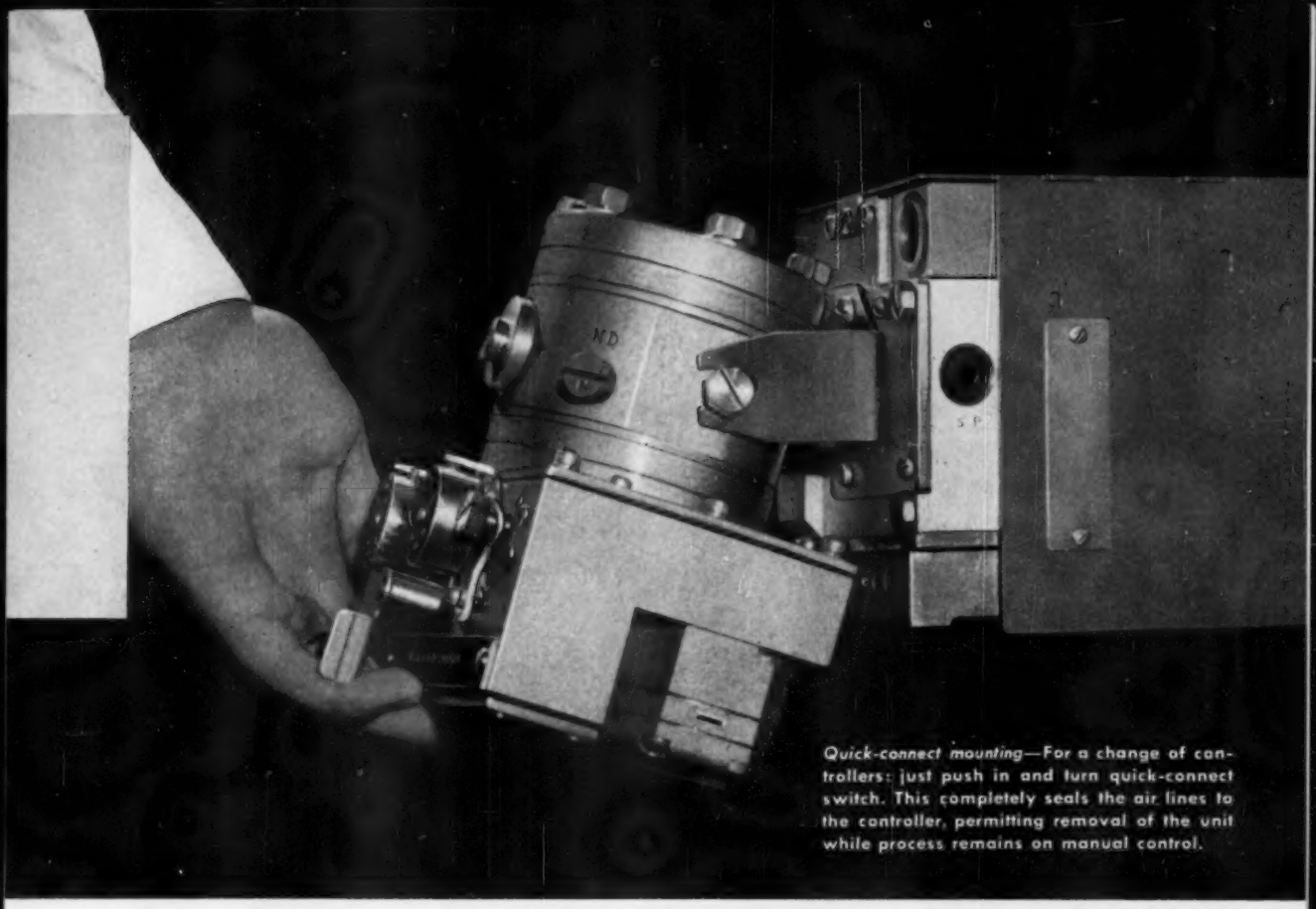
Save with the simplicity of



Three ranges of reset rates—Move a single sealing screw for choice of three reset ranges: 0.2-100, 0.01-5, or 0.04-20 repeats per minute.



Field-mounting manifold—Furnished for installations where controller is not mounted on the recorder. Has same quick-connect arrangement as rear of recorder, and external reset feedback or bypass relay for bumpless transfer from automatic to manual control.



Quick-connect mounting—For a change of controllers: just push in and turn quick-connect switch. This completely seals the air lines to the controller, permitting removal of the unit while process remains on manual control.

TEL-O-SET* controllers

New and improved *Tel-O-Set* controllers are low in cost, easily installed, compact, and require minimum maintenance. You can use them to control any process variable. One basic model serves for all applications. You can mount the controller anywhere: rear of receiver case, back of panel, or on the valve.

With all their simplicity, these instruments are highly sensitive and respond instantly to change. They operate on a pneumatic-balance principle which eliminates lost motion and friction.

Tel-O-Set controllers are an ideal complement to *Tel-O-Set* recorders and indicators... today's most advanced miniature instruments. For details, call your nearby Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

*Trademark of Minneapolis-Honeywell Regulator Co.

Honeywell

H HONEYWELL

First in Controls

MAKING BUTADIENE—4

Feed Preparation and Finishing by acetone or acetonitrile and CAA

Close volatilities of the C_4's make their separation difficult. One process scheme employs acetone or acetonitrile extractive distillation for the feed preparation and extraction with cuprous ammonium acetate for butadiene recovery.

By John C. Reidel
Petrochemical Editor

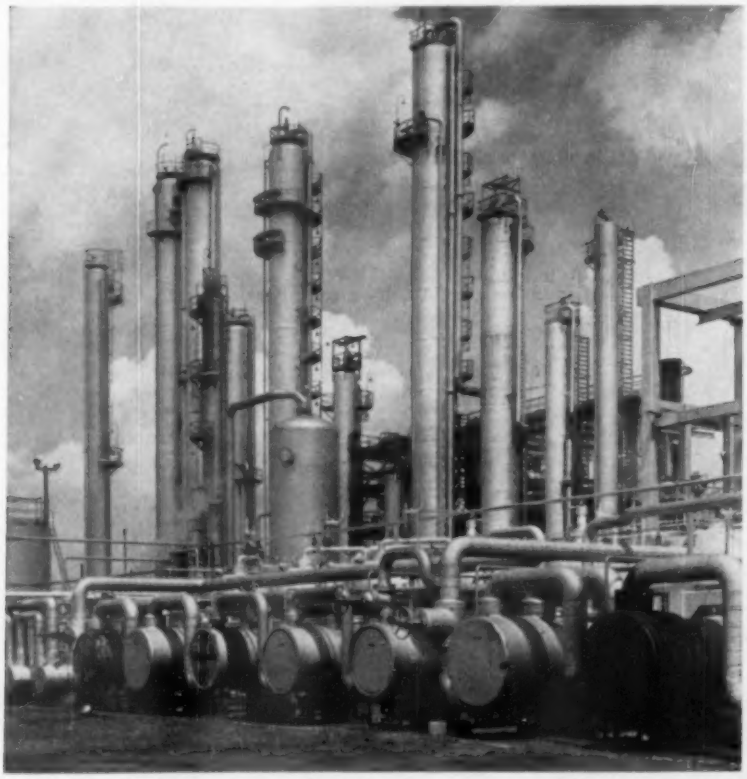
FOR BUTYLENES dehydrogenation a n-butylenes concentrate must be prepared. This may range in butene content from 80 to 95 per cent. The problem in feed preparation is essentially one of separating butanes and butenes.

Butadiene must be separated from the reactor effluent and finished to a purity of 98 per cent or better for GR-S copolymer manufacture or other use. Butadiene finishing consists essentially of separating the butadiene from the unreacted butenes and rerunning the butadiene to remove acetylene polymers, etc. (Where butane dehydrogenation is employed, the butadiene must be separated from butane and butenes.)

The type of feed preparation and butadiene finishing facilities used by each of the butadiene-manufacturing plants in the United States was noted in Table 1, in Part 1 of this report. Two of the plants with steam-dilution dehydro facilities use the Shell acetone extractive distillation for feed preparation together with cuprous ammonium acetate for butadiene extraction. It was noted previously that Shell at Torrance recently switched to acetonitrile in place of acetone for the feed prep.

Phillips developed extractive distillation with furfural. This is used for butylene concentration following the butylene dehydrogenation step, and for butadiene recovery following butylene dehydrogenation in Phillips' two-stage butane dehydrogenation at Borger. Two plants (Neches Butane and Petro-Tex) which operate steam-dilution - type dehydrogenation units, employ furfural extractive distillation for both feed preparation and butadiene recovery.

The newer installations with Houdry one-step butane dehydrogenation use either CAA or furfural extractive distillation for the butadiene finishing, although other methods could be used if desired.

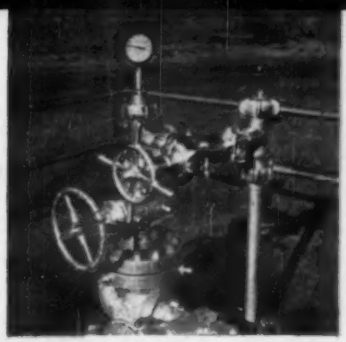


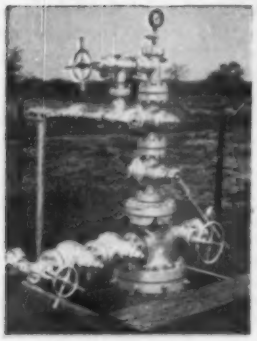
ACETONE EXTRACTICE DISTILLATION—This is unit at Humble Oil & Refining Co.'s butadiene plant at Baytown, Tex. Refinery butylenes are employed as feed stock.

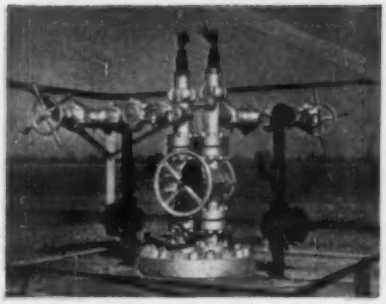
1. SEPARATING THE C_4'S—VOLATILITY PROBLEM

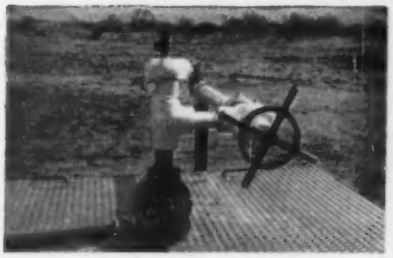
The feed for butylene dehydrogenation may come from refinery B-B streams or from dehydrogenation of butane. The composition of the C_4 fraction from catalytic cracking in the refinery will vary according to cat cracker feed and conditions of cracking. Two typical compositions (in LV per cent) are given in Table 8. These are for refinery B-B streams used as fresh feed for manufacture of butadiene by the steam dilution method.

As noted, Houdry butane dehydrogenation may be operated for production of both butadiene and butenes.









Nice thing about UNIBOLT Flow Manifolds . . .

you buy only what your well needs, and no more

Since well conditions and completion methods differ widely, no one Christmas tree flow control of the "fixed design" type can possibly serve all wells efficiently. Not so with UNIBOLT Flow Manifolds, the components of which may be readily arranged in any design to exactly fit well requirements.

These flexible Flow Manifolds, composed of standard UNIBOLT Tees, Crosses, Adjustable Wing Valves or Chokes, can be combined in a dozen different ways. Thus, you buy exactly what is needed for a given well.

And the entire manifold may be salvaged as a unit or in separate parts for later use in other manifolds.

From the lightest screwed manifold to the heaviest high-pressure assemblies and corrosion-resistant steel, UNIBOLT Flow Manifolds can be tailored to your needs. You save steel and, at the same time, you hold capital investment to a minimum.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

Kaiser Aluminum sheet for jacketing offers new economies through improved application methods

Recent developments make possible new low costs for the power, refinery and chemical industries

As you can see in the relative cost charts at the right, aluminum sheet jacketing now offers the *lowest first cost* of four well-known finishing methods for pipe insulation . . . and it offers *lower first cost* than wet-construction finishing methods for vessel insulation.

Another important fact, not revealed in the charts, is that aluminum's first cost is becoming *increasingly* competitive, thanks to newly-developed methods that speed application and reduce labor costs!

And if maintenance costs were added to the comparisons, aluminum would present an *even better value*—because only aluminum eliminates maintenance.* Its remarkable resistance to corrosion eliminates the need for painting . . . even when exposed to weather and mechanical abuse.

New Dry Wall Construction for Vessels

A number of improvements in application technique—developed by Kaiser Aluminum engineers in cooperation with specialists from various industries—adapt dry-wall type construction to the finishing of large cylindrical and flat insulated surfaces. These techniques virtually eliminate the need for costly application methods used to apply wet materials such as insulating cements, emulsions, mastics, adhesives, glue sizing and paint. Where corrugated aluminum sheets are used, positioning and fastening are simplified and speeded by familiar techniques employed for block insulations.

New "Snap-Back" Aluminum Jacketing Speeds Installation on Piping

Aluminum's unique advantages in light weight and superior workability have made possible greatly simplified preformed "snap" jackets for quick, easy application on piping.

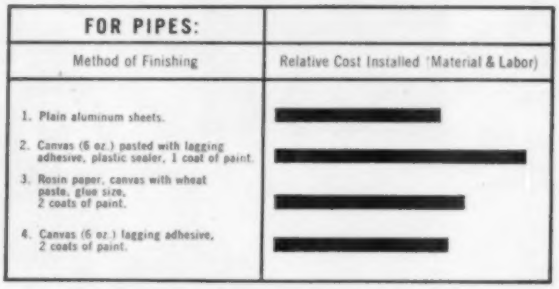
Jacketing, preformed into undersize tubes from stiff sheets of aluminum, will snap back to a tight fit when placed over pipe insulation, freeing both hands for fastening. This tight fit requires less fasteners per running foot.

The following is an outline discussion of important factors in aluminum jacketing materials and alloys, with suggested application methods best suited to various insulated surfaces, including pipes, vessels, vessel heads and others.

The Jacketing Alloys

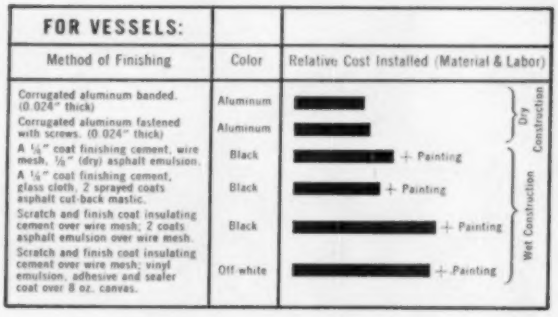
The following aluminum alloys, supplied in flat or coiled sheets, are successfully used for insulation jacketing: 1100, 3003, 3004, 5005, 5050, 5052, Kaiser Aluminum industrial roofing and siding alloy, and Kaiser Aluminum standard roofing alloy.

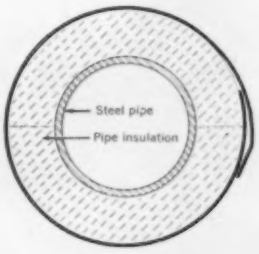
*Roofing felt has a lower initial cost than aluminum, but painting and maintenance offset this initial cost advantage.


FOR PIPES:
Method of Finishing
Relative Cost Installed (Material & Labor)
1. Plain aluminum sheets.
2. Canvas (6 oz.) pasted with lagging adhesive, plastic sealer, 1 coat of paint.
3. Rosin paper, canvas with wheat paste, glue size, 2 coats of paint.
4. Canvas (6 oz.) lagging adhesive, 2 coats of paint.

Results of first cost analyses of various insulation finishes

NOTE: Charts show first costs only. To arrive at total costs, maintenance costs must be added. Whereas other finishing methods require frequent and costly maintenance, aluminum jacketing is virtually maintenance-free.


FOR VESSELS:
Method of Finishing
Color
Relative Cost Installed (Material & Labor)
Corrugated aluminum banded. (0.024" thick)
Aluminum
Corrugated aluminum fastened with screws. (0.024" thick)
Aluminum
Dry Construction
A ¼" coat finishing cement, wire mesh, ⅛" (dry) asphalt emulsion.
Black
+ Painting
A ¼" coat finishing cement, glass cloth, 2 sprayed coats asphalt cut-back mastic.
Black
+ Painting
Scratch and finish coat insulating cement over wire mesh; 2 coats asphalt emulsion over wire mesh.
Black
+ Painting
Scratch and finish coat insulating cement over wire mesh; vinyl emulsion, adhesive and sealer coat over 8 oz. canvas.
Off white
+ Painting
Wet Construction



Sketch shows how preformed jacketing snaps back over piping, providing quick installation combined with tight fit. This is also demonstrated in photo titled "Teamwork."

Based on maximum economy and performance, the general recommendation is the use of Kaiser Aluminum alloy 5005 and Kaiser Aluminum industrial roofing and siding.

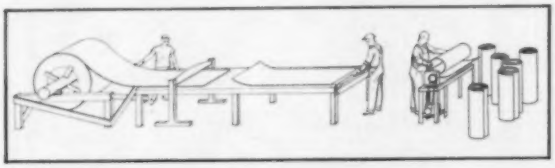
The reasons for this recommendation, and the exceptions to it, are as follows:

(a) Alloys in the 5000 series (which contain magnesium as the principal alloying element) and the clad alloys, such as AlClad 3004 (from which Kaiser Aluminum industrial roofing and siding sheet is made), offer superior corrosion resistance—especially in marine atmospheres.

(b) Alloy 5005 and the industrial roofing and siding alloy provide top performance at lowest cost for most jobs. Alloy 5050 shows an advantage from the standpoint of strength over 5005, and in many instances its slightly increased cost (a fraction of a cent per square foot) is warranted. Where exceptional strength is required, alloy 5052 should be used.

(c) Closely allied with alloy selection is a consideration of the section modulus of jacketing for large diameter vertical vessels. Kaiser Aluminum industrial roofing and siding sheet is superior in section modulus. On certain vertical vessels, usually those in the range of 3′ to 12′ in diameter, some designers prefer the close-up appearance of smaller corrugations. When this is preferred, most of the common alloys and the standard corrugated roofing alloy are satisfactory. Sheets should be 0.024″ thick, embossed, corrugated to 1¼″ x ¼″, and supplied in finished widths of 26″.

A metal thickness of 0.024″ is recommended in most cases. Corrugated aluminum 0.024″ thick can be banded at less material and labor cost than the thinner 0.019″ material fastened with screws. For insulated pipes with an O.D. of 12.75″ and less, 0.020″ thick aluminum sheet is recommended.



These illustrations show method used to fabricate snap jackets:

1. Using aluminum of proper alloy and temper . . .
2. Cutting it to proper dimensions for easy, economical installation . . .
3. Properly stiffening the overlapping edge by a simple angular crimp . . .
4. Forming it through a roller for proper circumference . . .
5. Snapping it around insulated pipe (below).

Teamwork—with one man to snap jackets in place and another to band them, two men can cover 700 feet of 10-inch diameter tubing in one day!

The best temper for pipe jacketing is ¾ hard, designed as H-16 or H-36. For fitting jackets requiring numerous lock seams, ½ hard temper, H-14 or H-34, is recommended.

Pipe Jackets

Snap jackets are a quick, easy and economical method of enclosing insulated pipe. The simple process shown above produces a most effective jacket for pipe insulation. (Kaiser Aluminum's booklet, *"Insulation Jacketing Materials and Methods."* explains and describes the process in full detail.)

The alloy recommended is 5005-H16, in coiled sheet form with plain finish. Embossed finishes are also available. Other alloys may be used, but it is desirable to use one alloy throughout. Width of coiled sheet should be 36″. Recommended thicknesses of sheets are 0.020″ for insulation O.D. of 12.75″ and under, and 0.024″ for insulation O.D. of 14″ and larger.

Vessel Jackets

Insulated vessels 36″ O.D. and less—horizontal or vertical—should be jacketed with 0.024″ thick by 36″ wide 5005-H16 alloy sheet, plain finish preferred.

For insulated vessels larger than 36″ O.D., horizontal mounting, use the same coiled sheet as above; for vertical mounting, use Kaiser Aluminum industrial roofing and siding, 0.024″ thick, embossed finished, ⅞″ deep corrugations with 2.67″ pitch.

Jackets for Large, Flat Surfaces

For breechings and ducts, indoors and out, Kaiser Aluminum industrial roofing and siding, 0.024″ and 0.032″ thick and having ⅞″ deep by 2.67″ pitch corrugations are most economical. Flat sheet, fluted sheet, and flat sheets stiffened with roll-formed standing seams offer other possibilities.

For insulated boiler walls, jackets may be made of aluminum sheets of several types. Thickness, size and fastening method will vary with specific boiler designs.

Fasteners

For pipes and vessels with insulation O.D. 36″ or smaller, bands may be slit from the same aluminum sheet used for pipe jackets, or they may be purchased as standard stock items. For pipe insulation O.D. 12.75″ and smaller, bands should be ½″ wide by 0.020″ thick, equal to A. J. Gerrard #305-AL; seals should be equal to A. J. Gerrard #202-AL. For pipe or vessels with insulation O.D. 14″ to 36″, bands should be ¾″ wide by 0.020″ thick, equal to A. J. Gerrard #311-AL; seals should be equal to A. J. Gerrard #204-AL. For vessels with insulation O.D. 36″ and larger, ¾″ wide by 0.020″ thick #18-8 stainless steel expansion bands should be used. Banding should be equal to A. J. Gerrard Expand-R-Strap, #E311 ½ S-4; seals should be #18-8 stainless steel, equal to A. J. Gerrard #204-SS.

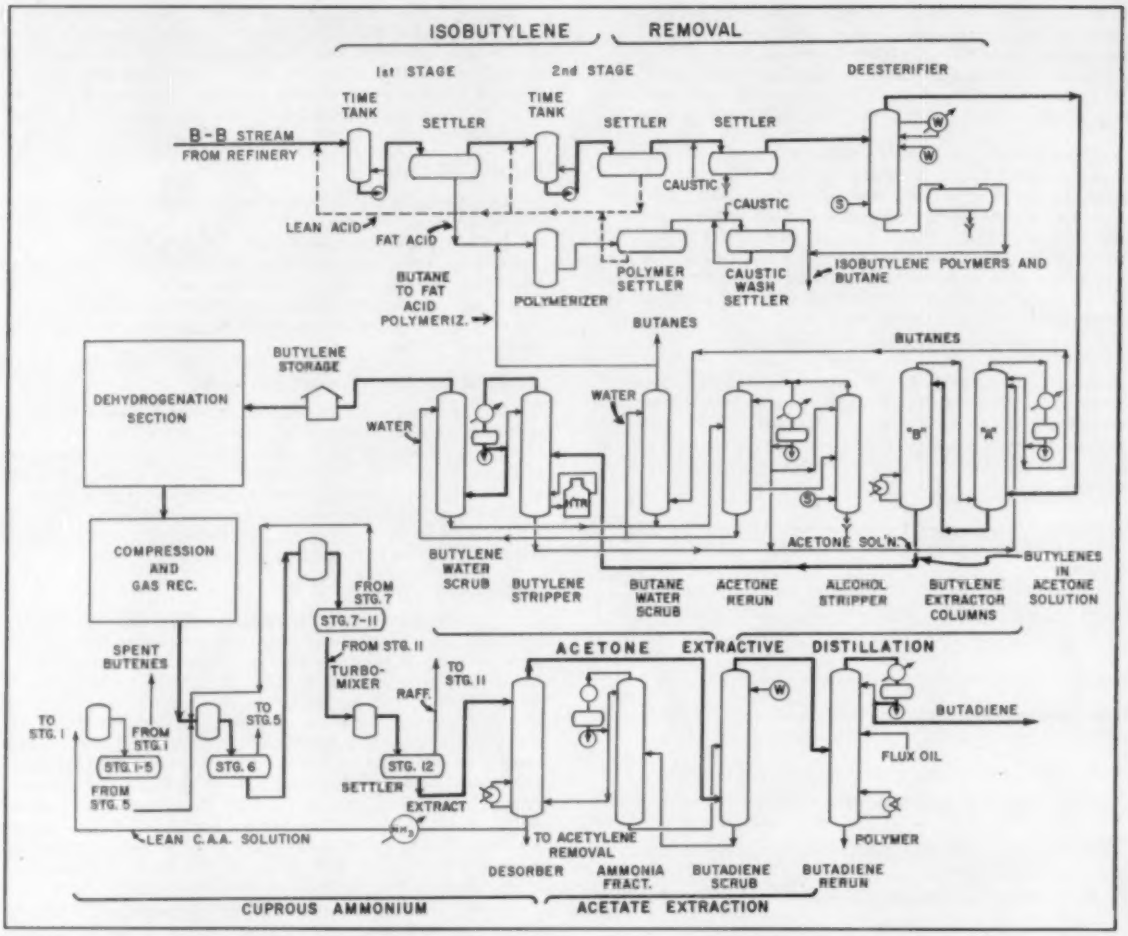
When required for pipe and fitting jackets, #7 by ½″ aluminum pan head self-tapping screws, Type A, are suggested. Side laps and flashing with corrugated vessel jackets should be fastened with #7 x ¾″ aluminum pan head screws, Type A. Aluminum screws should be made from either 6061-T6 alloy or anodized 2024. For fastening aluminum jackets to steel structural members, use #14 hex head screws, Type B, made from stainless steel #18-8 alloy; #410 is acceptable.

Composite studs made from #18-8 stainless steel and aluminum (equal to Nelson Rivweld Studs or to Nelson Set Lock Studs supplied with aluminum washers) may be used to fasten corrugated aluminum jackets to angles. On siding, fasten studs on low part of corrugation. On roofing, fasten studs on crown of corrugation.

Aluminum Jacketing Booklet Available

Kaiser Aluminum's new booklet, *"Insulation Jacketing Materials and Methods,"* gives you complete details on the subjects outlined above. It also presents illustrated step by step application methods plus material and accessories charts to help you take advantage of recent advances in aluminum sheet jacketing. Forty fully illustrated pages in all! To get your free copy, write to: *Kaiser Aluminum & Chemical Sales, Inc., Process Industries Department, 919 N. Michigan Ave., Chicago 11, Illinois.*

KAISER Aluminum



ACETONE AND CAA—Simplified flow sheet for butadiene processing when using acetone extractive distillation for feed preparation and extraction with cuprous ammonium acetate solution for butadiene recovery. Fig. 5.

The reactor effluent composition in this case will consist largely of unconverted n-butane, n-butenes, and butadiene. Composition of a typical butene-rich Houdry reactor product was given earlier when discussing the Houdry process. Similarly, the reactor effluent in the first stage of the Phillips butane dehydrogenation will contain some butadiene.

It was noted also that both sources of feed—refinery B-B stream and butenes from Houdry dehydrogenation—may be used within the same plant, as in the case of Petro-Tex. The possible tiein, when using furfural extractive distillation, was indicated in Fig. 4.

TABLE 8—REFINERY B-B STREAM COMPOSITIONS

	Plant 1	Plant 2
Propane and lighter	3-4	1-2
Isobutane	23-8	35-7
n-Butane	24-9	17-18
Isobutylene	15-12	14-13
n-Butylenes	31-25	32-28
Pentane and heavier	4-2	1-2

Close volatilities . . . The C_4 hydrocarbons lie very close together in volatility. (Vapor pressures are tabulated in the API Project 44 "Selected Values . . . Properties of Hydrocarbons . . .," Carnegie Press, 1953; and are plotted in Maxwell's "Data Book on Hydrocarbons," D. Van Nostrand, 1950.) The components that may be encountered in feed preparation are shown in Table 9.

In butadiene purification still other components are involved such as vinyl acetylene, ethyl acetylene, butadiene-1,2 and pentadiene-1,4, etc.

Extractive distillation . . . To make the desired separations a material (extractive agent or "solvent") is employed which alters the normal relative volatilities. The process scheme when handling a B-B stream by acetone extractive distillation is indicated in Fig. 5. (This same arrangement of equipment may also be used for acetonitrile extractive distillation.) Here (Fig. 5) the whole B-B stream goes through the isobutylene removal section with subsequent separation of butenes from butanes (feed preparation) by extractive distillation with acetone or acetonitrile.

TABLE 9—BOILING POINTS OF C_4 HYDROCARBONS

	B.p., °F. at 29.21 in Hg
Isobutane	10.9
Isobutylene	19.6
Butene-1 (α-butylene)	20.7
Butadiene-1,3	24.1
n-Butane	31.1
trans-Butene-2 (β-butylene)	33.6
cis-Butene-2 (β-butylene)	38.7

Factors in Extractive Distillation

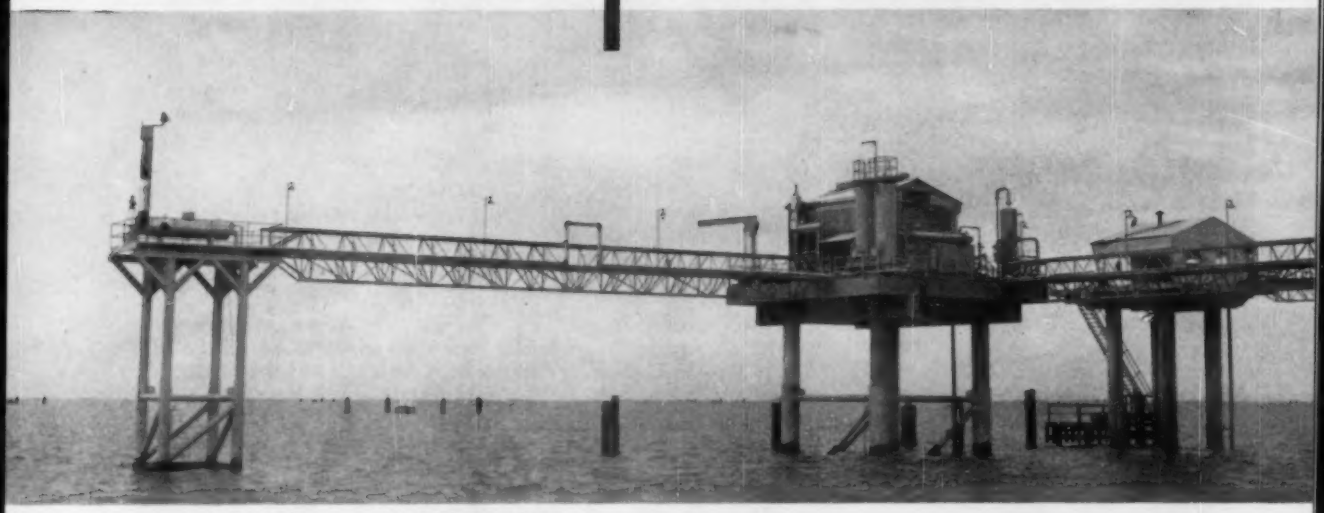
Gilliland[9] and Happel[39] have reviewed the principles underlying separation of C_4's. Atkins and Boyer[32] have given the background on the acetone extractive distillation.

Some of the major points can be summarized here:

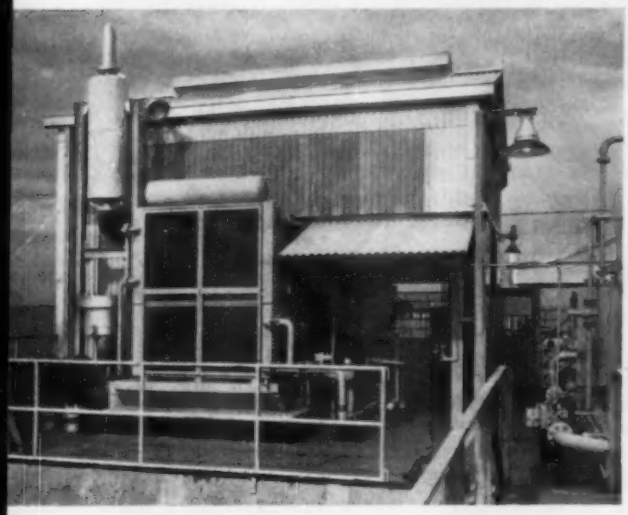
1. Modifying the α's . . . The relative volatility between two components

Southwest

PACKAGED COMPRESSORS PERFECTLY BALANCED FOR PILING



Shell Oil Company — Block 35 — South Louisiana



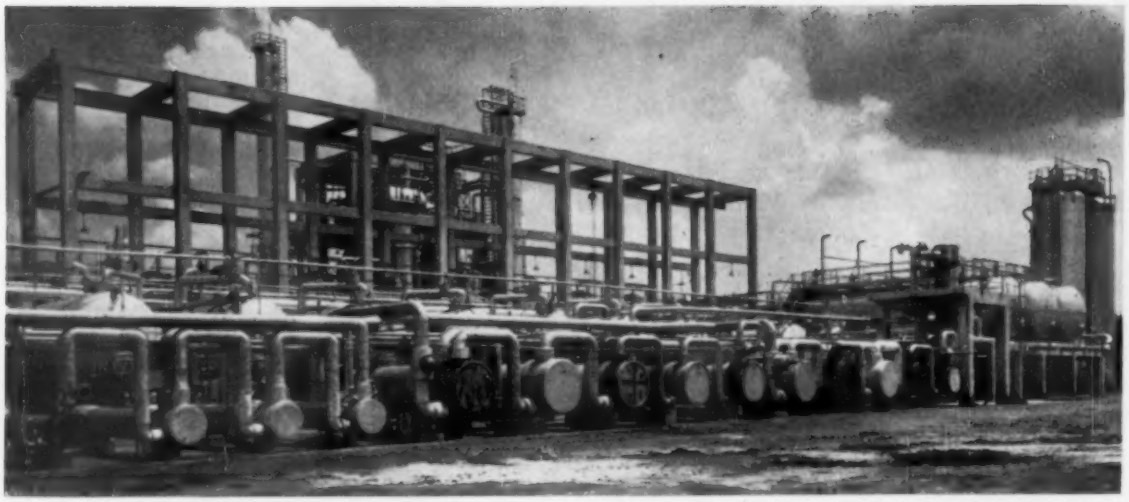
FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS.

Here, in the Gulf of Mexico, this Southwest Packaged Gas Compressor, incorporating a Cooper-Bessemer GMXD-4 engine, compresses 4 million cubic feet of casing head gas per day from 350 to 900 psi. Proof that the perfect balance of the Southwest unit permits installation on any type of foundation. Pre-stressed concrete platforms, wooden piling, floating or submersible barges, are all the same to the rugged, perfectly balanced Southwest Packaged units. In addition to the economies of Packaged Gas Compressors, Southwest can deliver directly by barge from the Port of Houston to your location, eliminating costly rail-barge transfers.

The unattended operation, possible with the automatic controls and safety devices on Southwest Packaged Compressor Plants, cuts operating cost per horsepower-hour to a fraction of the cost of a fully attended stationary installation. A Southwest engineer can show you actual comparative operating costs. Available in sizes from 265 h.p. to 660 h.p.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas



CAA UNIT—Extraction with cuprous ammonium acetate is used by Humble for separation of butadiene at the Baytown plant.

can be altered effectively by addition of a third material provided the two components deviate significantly from the ideal in their volatility behavior. The C_4's do deviate enough to make separation in this manner possible. The deviation from Raoult's law depends on what is roughly termed "polarity." The C_4's have relatively low polarity and use of an extractive agent of higher polarity is necessary.

2. Amount of solvent circulated . . . Relative volatility created by the extractive agent is a function of solvent composition (amount of water used) and the solvent-hydrocarbon ratio on the column trays. As the proportion of extractive agent is increased, the relative volatility of the hydrocarbon components is increased, but the hydrocarbon-handling capacity of the column is reduced. About 80-90 mole per cent of agent on the trays seems to be optimum. With acetone, hydrocarbon on the trays may be as high as 20 mole per cent; with furfural nearer 10 per cent.

Also, the amount of agent used is limited by the hydrocarbon solubility in the agent. Addition of a material, with a still higher polarity such as water, improves the selectivity still further. This is particularly marked with acetone. Water is added in the proper balance so as to obtain greater increase in relative volatility without separation of two liquid phases. In practice, 4-6 weight per cent of water is used with furfural and 18 weight per cent or higher with acetone.

Operation is normally conducted close to the point of hydrocarbon phase separation to obtain maximum selectivity effect from the solvent. Therefore the reflux rate must be carefully controlled to prevent phase separation and flooding at relatively low flow rates. This is true for both acetone and furfural. For a given feed the operator of the extractive distillation columns must establish the optimum relation between reflux ratios and relative volatilities to give maximum recovery of desired components without flooding.

3. Relative proportions of HC's . . . The relative volatilities will vary according to the relative proportions of the different hydrocarbons at a given solvent-hydrocarbon ratio. This is illustrated with an example by Gilliland.[9]

4. Tray efficiencies . . . When using bubble towers with furfural the plate efficiencies were reported by Gerster et al.[42] and by Happel[39] to average 25 per cent, although Phillips is reported to attain higher efficiencies. With acetone (lower viscosity) the plate efficiencies may go as high as 60 per cent.

2. ACETONE OR ACETONITRILE

Fig. 5 is typical of facilities operating on a refinery B-B stream and employing acetone and CAA.

Isobutylene removal . . . This is accomplished with 60-65 per cent H_2SO_4 which is selective for isobutylene. A conventional two-stage cold acid polymerization operation is indicated in Fig. 5. Baumann and Smith[31a] gave details on the combined extraction-regeneration process. On contacting the hydrocarbon stream with the acid, an isobutene acid complex is formed. This "fat acid" is settled out. The effluent hydrocarbons, now virtually free of isobutylene, are caustic washed to neutralize any acid carryover and go to the deesterifier. The fat acid is heated to form isobutylene dimer which is insoluble in the acid. Regenerated acid is recycled from the polymer settler. The isobutene polymers are returned to the refinery where they may be debutanized to provide alkylation feed. The cold acid process may also be operated such that isobutylene monomer is regenerated from the acid extract and sent to a butyl-rubber operation.

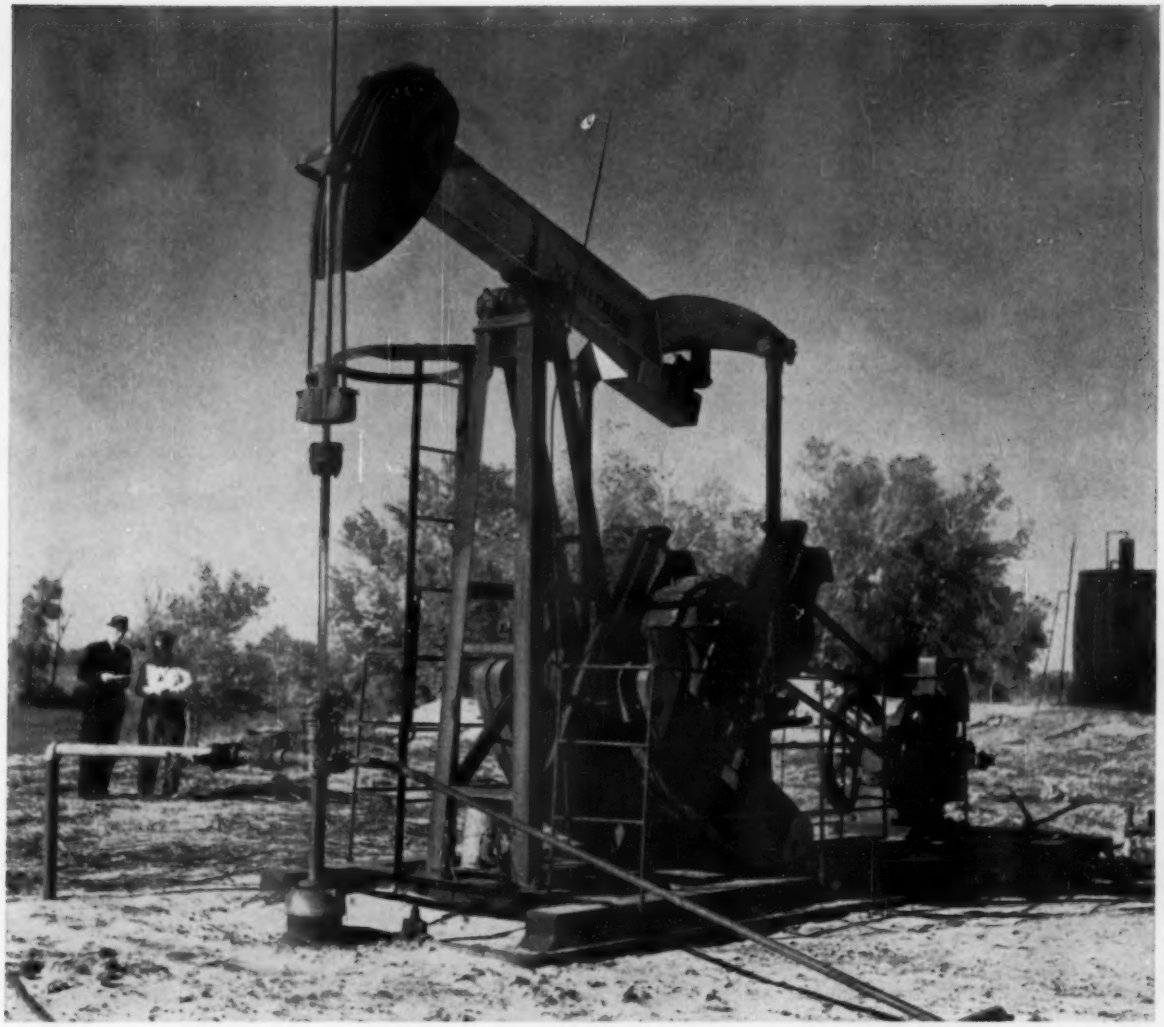
Since hot dilute sulfuric acid is extremely corrosive the scheme indicated in Fig. 5 is designed for elimination of heat exchangers in the fat acid circuit. The fat acid is mixed with butane for heating and the mixture passed to the polymerizer where the dimer is permitted to form. The dimer-butane mixture is then cooled, first by mixing with a stream of cold butane and then by reduction of pressure in a flash-cooling step. (These cooling steps are not shown in Fig. 5.) The butane which was added for cooling is vaporized and then condensed and recycled.

An alternate scheme is to heat the fat acid with steam in exchanger equipment and minimize equipment corrosion by providing a chilled-water (refrigerated) recirculation system to remove the heat evolved in formation of the isobutylene-H_2SO_4 complex and subsequently to cool the acid-polymer mixture.

The hydrocarbon effluent from the cold acid plant is rerun in the deesterifier to remove carryover from acid contacting consisting of entrained sulfuric acid ester, alcohols, polymers.

Extractive Distillation With Acetone

The process developed by Shell employs acetone to modify the normal volatilities, particularly that between n-butane and the lower-boiling of the



"46" Rods Completing Fourth Year In 3350-ft Well Near Wichita

How's this for dependable service? A string of Bethlehem ¾-in. "46" sucker rods is rounding out its fourth year of pumping duty at Well No. 1 of the Wolfe Lease, operated by Branine & Holl, Wichita, Kansas.

The 3350-ft well is producing approximately 100 bbl of water and 20 bbl of 34-gravity oil daily from the Arbuckle formation. The pumping unit, a Bethlehem 57DA—12 SP, uses a 42-in. stroke, at 18 spm.

The Bethlehem "46" Sucker Rod is carefully made of nickel-molybdenum steel, and is both normalized and tempered. It is a quality rod in every way, one you can always count on to provide long, economical service in heavy-pumping duty.

In addition to the "46" rod, Bethlehem manufactures other types of alloy sucker rods, enabling you to choose rods best suited to any given fluid condition. We also produce a complete line of sucker rod accessories.

For complete data about Bethlehem sucker rods and companion products, all you need do is get in touch with your Bethlehem sucker rod distributor.

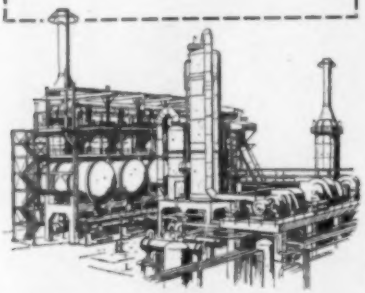
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

on stream
in the
United States

ANOTHER
HOUDRY
DEHYDRO
PLANT



The Firestone Tire & Rubber Company
Orange, Texas

For the production of butadiene at its new Orange, Texas, plant, Firestone selected the Houdry Catalytic Dehydrogenation Process—the only commercial single-step process for transforming normal butane into butadiene.

This Texas installation has a design capacity of 40,000 ton/yr of butadiene. It joins the others designed and licensed by Houdry which, from the time the synthetic rubber industry changed from governmental to private control, have accounted for over 50% of all new U. S. butadiene capacity.

For full information about Houdry Processes and Catalysts —and their applications to your company's particular problems—write to:

HOUDRY
PROCESS CORPORATION
1528 Walnut Street, Philadelphia 2, Pa.
Pioneer in Catalytic Processes

"Shell at Torrance uses acetonitrile for feed preparation."

butene-2's (trans-butene-2) thus making possible the separation of the butanes from the butenes.

Butylene extractor column . . . The feed to this column may consist of 1-2 per cent isobutene, perhaps 60 per cent iso and normal butane and the rest butenes with the butene-2's predominating in a roughly 2-1 ratio to butene-1. It may be desired to operate two columns in series to increase butylene recovery, as indicated in Fig. 5.

For example, in describing the Humble installation at Baytown, Atkins and Boyer[32] noted that a second butylene extractor column of 52 plates was added to the original 57-plate column. The 52-plate column then constituted the upper portion (Section "A" in Fig. 5) of the total 109-plate extractive distillation unit. Solvent was introduced on the fifth plate from the top leaving a solvent retention zone above this. The hydrocarbon feed coming from the deesterifier can enter at the bottom of the Section "A" column, which in the case of Humble would leave a main extractive distillation zone of 104 plates. The composition gradient will be from predominantly isobutane toward the top of the "A" column to about 95 per cent butylenes at the bottom of the "B" column.

Alternatively, depending on the particular plant conditions and desired butenes recovery, a single butylene extractor column may be employed. At one plant, for instance, a 13-ft. 6-in.-diameter by 155-ft. column with some 70 plates has been employed.

The spent butanes are removed as overhead product from the extractor column, are water-washed to recover acetone and employed as heating medium in fat acid polymerization as explained before. Butylenes in acetone solution go to the butylenes stripper. Acetone solution from the bottom of the stripper is recirculated to the butylene extractor column. The stripper overhead constitutes the butylene concentrate stream. Following water wash it goes to storage as dehydrogenation feed.

Acetone recovery . . . Residual acetone from the water scrub columns goes to the acetone rerun column. This concentrates acetone from the water-wash streams. It operates in conjunction with a smaller alcohol stripper which removes side-product alcohols from the acetone.

Atkins and Boyer[32] dealt with vapor-liquid equilibrium in acetone extractive distillation and presented a simplified calculation method.

Acetonitrile Extractive Distillation

The use of acetonitrile has been suggested[33] and recently Shell made the switch in extractive agents at the Torrance plant.[34] The advantage of using acetonitrile is that, in effect, better butylene recovery can be realized in an existing column. At Torrance, Shell uses a single column 12 ft. 6 in. in diameter by 180 ft. with 71 trays. As practiced at Torrance, the critical separation is between n-butane and α-butylene since maximum recovery of butylenes in incoming mixed C_4 stream from Standard of California's Houdry unit is desired. Relative volatility between n-butane and α-butylene is increased to almost 1.50 (actually 1.45) when using acetonitrile as compared to about 1.20-1.25 when using acetone. Acetonitrile has a higher boiling point than acetone. Therefore Shell had to provide greater reboiler surface for the butylene stripper; also since the solvent leaving the stripper would be hotter, additional exchanger surface was required to cool the solvent before it entered the extraction column. This was accomplished by interchanging the existing solvent cooler with the extraction column feed vaporizer. Shell also converted the existing acetone rerun column to vacuum operation for acetonitrile concentration.

3. BUTADIENE EXTRACTION—CAA

The dehydrogenation effluent, after passing passing through the gas-recovery section, may contain in the order of 15-25 mole per cent of butadiene together with unreacted butenes and some butane. To extract the butadiene from such a mixture, Esso Research developed a process using ammoniacal cuprous acetate solution. This is based on the formation of addition compounds with unsaturated hydrocarbons. The cuprous acetate solution exhibits a high selectivity for butadiene. The solubility of the olefins in the solvent is low relative to butadiene. Happel[39] and Gilliland[9] have reviewed the mechanism of the reactions. Some 95 per cent of the butadiene in the feed can be recovered by this method.

The process may be thought of as taking place in these steps: (1) **absorp-**

avoid the hazards of carburetor icing with

GULF AGENT 178

...a better, less costly anti-stalling additive

Now you can stall-proof your modern volatile motor gasolines with a performance-proved additive at a lower cost than ever before.

FULLY PROVEN IN SERVICE—More than 25 billion miles of stall-free driving is proof of the effectiveness of Gulf Agent 178 in modern volatile motor gasolines.

INEXPENSIVE—Only 15 to 25 pounds of additive are required per thousand barrels of gasoline. No expensive storage space is required since you need so little of Gulf Agent 178.

EASY TO USE—Gulf Agent 178 is readily soluble in all petroleum products and can be blended easily at temperatures from minus 30° to plus 140° F. It is insoluble in water and can be used in conventional gasoline transfer systems with no danger of loss from water leaching.

RUST PROTECTION—Gulf Agent 178 gives you an extra benefit by providing corrosion protection at no extra cost. Rust prevention lengthens the life of distribution and storage facilities all the way from refinery to customer.

Let us show you how Gulf Agent 178 can improve your gasoline!

GULF

Petrochemicals Department
GULF OIL CORPORATION
Gulf Building, Pittsburgh 30, Pa.

QUALITY CHEMICALS
from
PETROLEUM

HENRY H. PARIS DISTRIBUTOR, Inc.

OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES

1125 ROTHWELL ST. • P. O. BOX 932 • HOUSTON, TEXAS

Agent and Distributor for the Following Nationally Known Manufacturers:

ALTEN FOUNDRY & MACHINE WORKS
Lancaster, Ohio
Surface Equipment.

THE OHIO INJECTOR COMPANY
Wadsworth, Ohio
OIC Valves, Bronze, Iron, Cast, and Forged Steel for all purposes.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

LOS ANGELES BOILER WORKS, INC.
Los Angeles, Calif.
Welding Cups—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

tion of the butadiene with some undesired hydrocarbons in the solution, (2) **stripping** out of the undesired hydrocarbons to get the proper butadiene purity, and (3) **desorption** of the butadiene from the solvent.

Vapor-liquid operation . . . The CAA process was used as an extractive distillation technique at some of the smaller butadiene manufacturing installations, using a reboiled absorption system. The butadiene was absorbed from the hydrocarbon vapor stream in a reboiled bubble-plate or packed column.[35] When operating with a bubble-plate column, tray efficiencies were between 10 and 20 per cent. The small quantities of butenes absorbed along with the butadiene were stripped from the solution in an enrichment step. After this came the usual desorption and butadiene rerun. Operating with hydrocarbon in the vapor phase required cooling of the CAA solution to roughly the hydrocarbon dew point in order to obtain higher solubility.

Multistage liquid-liquid . . . The CAA process scheme, such as used today at some of the major butadiene installations, is indicated in Fig. 5. A 12-stage system is shown here. Fresh feed enters at the intermediate Stage 6. Stages 1-6 constitute the **absorber** section, Stages 7-11 the **stripper** section, and Stage 12 is the **rejection** stage. Lean CAA solution goes back into Stage 1. The overflow (raffinates) recycle back countercurrently from the final (rejection) stage through all the other stages and finally out through Stage 1 (spent butenes).

This turbomixer and settler system, operated as a countercurrent liquid-liquid extraction with recycling between stages, makes possible efficiencies approaching the theoretical with extraction of essentially all the butadiene. The temperature-solubility behavior is contrary to the behavior with acetone and furfural. For CAA solutions, lower temperature leads to higher solubility. The effect of temperature is quite marked; it is desirable to use an operating temperature of 25° F. or lower. An ammonia refrigeration unit may be employed. By operating at low temperature with hydrocarbon in the liquid phase the solvent circulation to charge stock ratio can be reduced. Also, at the lower temperature the heat of reaction is lower. This results in somewhat smaller refrigeration capacity.

Operating conditions . . . These may be summarized for a typical operation as in Table 10.

Field-Replaceable Dogs Reduce Overall Costs of

MISSION "ROLLING DOG" TUBING SPIDERS

THE SLIPS USED in Mission Tubing Spiders feature field-replaceable "Rolling Dogs" for positive grip and instant release. Simply by changing dogs, the operator can change slip size or completely renew the gripping surface at a fraction of the cost of new slips.

Mission Tubing Spiders are simple, rugged and easy to handle. They can be operated quickly and easily either at floor level or on the tubing head.

Save time and money. Use Mission "Rolling Dog" Tubing Spiders. They are available through all supply stores.

Nothing but the finest will bear the name of MISSION MANUFACTURING CO

MISSION MANUFACTURING CO. • *P. O. Box 4209* • *Houston, Texas* • *Cable Address—"Missco"* • *Export Office: 30 Rockefeller Plaza, New York*
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • *17 Hanover Square* • *London, W. 1 England* • *Cable Address—"Missoman"*
SLUSH PUMP VALVES • PISTONS • VALVE SEAT PULLERS • LINERS • PISTON RODS • VALVE SPRINGS • GLAND PACKINGS • • SLIPS • SWABS • PLUG VALVES • CENTRIFUGAL PUMPS

Sinclair on move in Canada

One of the most active and exciting oil areas today is Canada. And there, through Sinclair Canada Oil Company, the Sinclair organization is progressing rapidly.

Its oil production now averages 5,000 barrels daily and is still growing. Sinclair has become part owner of pipe lines moving Canadian crude and has a 40 per cent interest in a St. Paul, Minn. refinery processing such oil.

The Company's oil search stretches 1,200 miles from southeastern Saskatchewan to northwest British Columbia. It covers more than 4 million gross acres. The $10 million exploration program in progress this year is the Company's most extensive Canadian undertaking thus far, and typifies the steady growth of Sinclair's crude oil exploration and production.

SINCLAIR

A Great Name in Oil

SINCLAIR OIL CORPORATION · 600 FIFTH AVENUE · NEW YORK 20, N. Y.

"CAA extraction gives nearly theoretical efficiencies."

TABLE 10—TYPICAL CAA PROCESS CONDITIONS

Lean CAA solution temperature, °F.	8
Lean CAA solution pressure, psig.	45
Ratio CAA solution feed, lb./lb.	8
Desorber bottom conditions:	
Temperature, °F.	175
Pressure, psig.	15

Extract . . . The rich solvent (extract) stream from the final stage goes to the desorber which operates at conditions (bottom) of 175° F. and 15 psig. A high degree of desorption of the butadiene is required. This is accomplished in the desorber by heating and by reduction in pressure. The lean CAA solution, after cooling, is returned to Stage 1. The butadiene stream, coming as the overhead vapor from the desorber, is water washed to remove traces of ammonia, which is undesirable in copolymer operations, and the ammonia is concentrated in the ammonia fractionator. (The ammonia recovered in the butadiene scrub tower must be returned to the CAA solution in a highly anhydrous state.)

The washed butadiene vapors are compressed, condensed by refrigeration, and go to the butadiene rerun tower. Here higher-boiling materials are removed to bring the stream up to 98 per cent or better butadiene. This tower uses a flux oil to help in the separation of the relatively small quantity of higher-boiling materials accumulating in the bottom of the tower. The recovered butadiene is cooled by refrigeration and inhibited against polymerization.

Acetylenes removal . . . One of the items of concern, when the CAA process was first placed in operation, was how to remove the higher acetylenes and other highly soluble compounds such as pentadiene-1,4 and butadiene-1,2 which are also extracted and build up in the CAA.[36] These compounds retard copolymerization in the GR-S manufacture. There is also objection to cuprous acetylides in the CAA since these are a potential hazard and acetylides polymers promote formation of hydrocarbon - solvent emulsions and foams. These are stable emulsions leading to operation difficulties with priming and foaming in the butylene extractor and the desorber.

A portion of the lean CAA solution is purified in the acetylenic compound removal section. Here formation of polymers may be hastened by controlled heating of the CAA. The polymers are removed by adsorption on charcoal or activated carbon followed by filtration. Another method is to remove these objectionable compounds by additional desorption of the lean CAA. Still another method is mentioned by Reilly[11] as being used by Polymer Corp. It is to contact a slipstream of the solvent with the fresh feed entering the extraction section. The acetylene hydrocarbons are more soluble in the CAA than in butadiene. Nearly all the acetylenes, but only a small amount of butadiene, are absorbed. The latter can be recovered in a mild stripping operation. More severe stripping removes the acetylenes. Charcoal filtration removes acetylinic polymers and the purified CAA is returned to the main solvent stream.

Ketones . . . Reilly[11] notes that less total side products are produced when using Dow catalyst for dehydrogenation than with other catalysts. However, more acetylene hydrocarbons are formed than with Shell catalyst, amounting to about one-eighth of 1 per cent by weight of the butadiene production, or about twice that with Shell catalyst. Also total ketones formed with Dow catalyst amounted to an average (calculated as acetone) of 4 per cent by weight of the butadiene production.

This compares with negligible ketone formation when using other catalysts. The ketones, Reilly states, suppress solubility of butadiene in the CAA and therefore interfere with the operation of the desorber. Ketones can be removed by providing a water wash of the dehydrogenation reactor effluent vapors just ahead of the gas recovery section. Operation of the desorber in the butadiene recovery section is satisfactory if ketones in the feed to the extraction units are kept down to about 0.1 per cent.

"If you want high test, lady, would you mind backing her up just a little."

Raffinate . . . The raffinate (rejected butenes and butanes) containing perhaps 1 per cent butadiene leave from the first stage countercurrent to entering lean solvent, go to a raffinate after-settler (not shown in Fig. 5) and are water washed. This raffinate stream may be recycled back to dehydrogenation. It may be split, with a portion joining the B-B fresh feed to control isobutylene and butane contents in the feed prep; the remaining portion may go directly to dehydrogenation. Alternately, the raffinate hydrocarbon stream may be returned to the refinery as alkylate feed.

Yields . . . Typical feed and product analyses in mole per cent are shown in Table 11.

TABLE 11—CAA PROCESS—TYPICAL YIELDS

	Feed	Products — Butadiene	Products — Spent butenes
C_3's	0.2	0.3	0.3
Butadiene	16.7	*98.5	0.9
Isobutene	4.9	0.2	5.7
n-Butenes	62.8	1.0	75.1
Butanes	15.3	. . .	17.9
C_5's	0.1	. . .	0.1

*Minimum.

Selected References

ISOBUTYLENE REMOVAL

31a. G. P. Baumann and M. R. Smith, "Isobutylene Manufacture Using Sulfuric Acid Process," The Oil and Gas Journal, September 27, 1954, p. 71.

ACETONE EXTRACTIVE DISTILLATION

32. G. T. Atkins and C. M. Boyer, "Application of McCabe-Thiele Method to Extractive Distillation Calculations," Chem. Engr. Progress, September 1949.

ACETONITRILE EXTRACTIVE DISTILLATION

33. A. McKinnis, U. S. Pat. 2441827 (May 18, 1948).

34. Anon., Chemical Engineering, February 1957, p. 146.

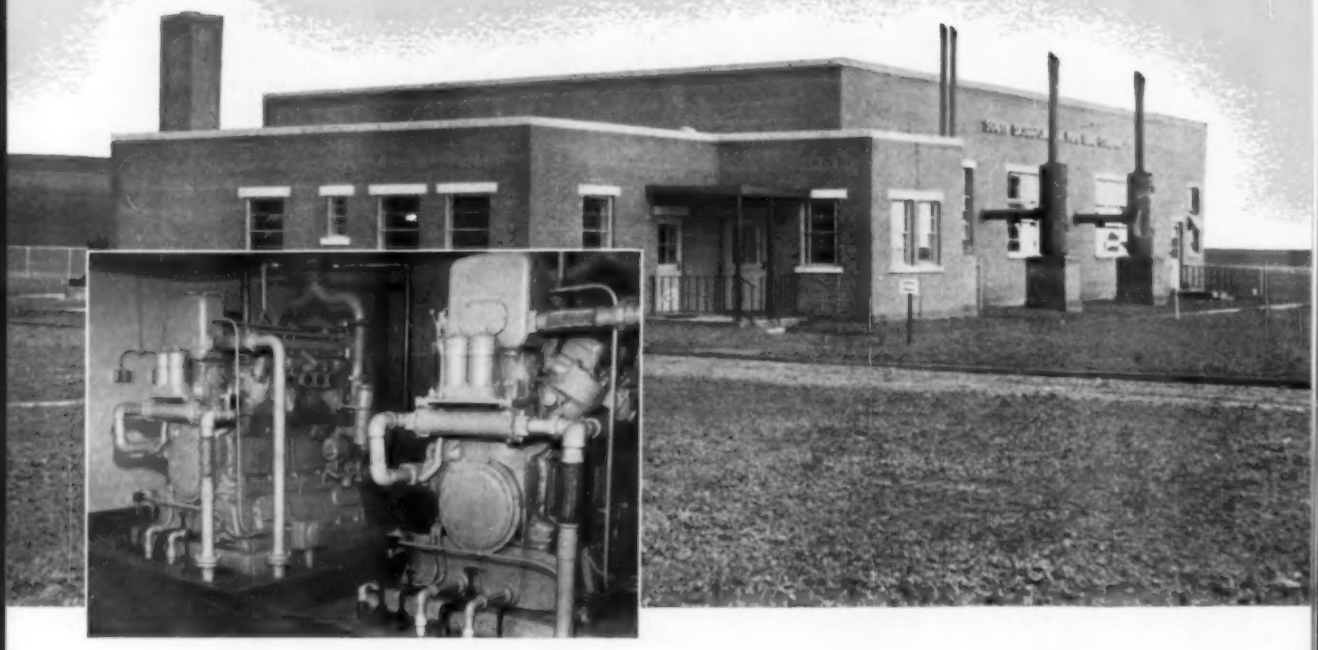
BUTADIENE EXTRACTION—CAA

35. C. E. Morrell, W. J. Paltz, J. W. Packie, W. C. Asbury, and C. L. Brown, "Purification of Butadiene with Cuprous Salt Solutions," Trans. AIChE 42 (1946), p. 473.

36. C. E. Starr, Jr., and W. F. Ratliff, "Impurities in Petroleum Butadiene from Copper Salt Solutions," Ind. Eng. Chem. 38 (1946), p. 1020.

In Cantuar, Saskatchewan

"Entire operation" of this million dollar pumping station depends on two CAT* Electric Sets



The heart of the Cantuar Pumping Station, owned by the South Saskatchewan Pipe Line Co., is two Caterpillar D364 Electric Sets. These units, used alternately, are each rated at 125 KW at 1200 RPM. But it was their dependability that sold them.

"Our entire operation hinges on their round-the-clock dependability," reports George W. Petrie, chief engineer at the station.

And the operation is a vital one to the company. The Cantuar Station is the main pumping installation on a 158-mile 16-inch line between Cantuar and Regina. It handles a line capacity of 25,000 barrels a day from 33 gathering stations and 120 miles of gathering lines. It is absolutely essential that the electric sets work around the clock—*without failure.*

And now, Caterpillar has a completely new line of dependable generators. They are completely self-regulated and require neither an experienced engineer nor operator

The line is complete up to 350 KW and the power units can be tailored to your *exact* needs. You can get them equipped with independent gasoline starting engines, air or electric starting, or automatic start-stop for standby. The D375, which supersedes the D364 in the Caterpillar line, can be had in naturally aspirated, turbocharged, Roots blown, or spark-ignition models.

With each electric set you get the added protection of quick, efficient service from your Caterpillar Dealer—always ready to keep your equipment running with parts you can trust. See him soon and select the set that fits your needs.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

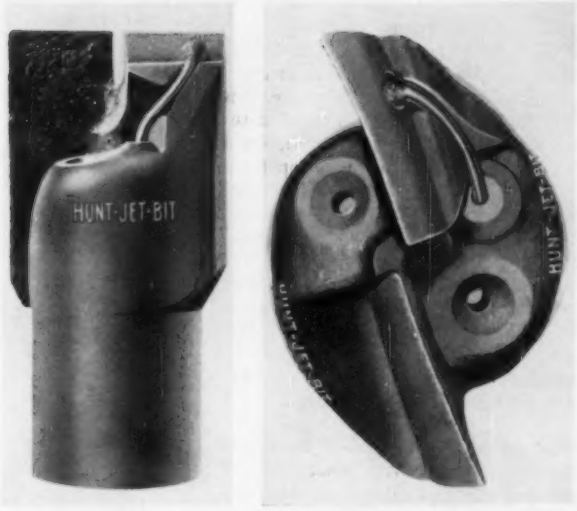
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

A QUARTER CENTURY OF DIESEL LEADERSHIP

Some oil men wonder:

Did We Bury The Drag Bit Too Soon?

By Ed McGhee
District Editor



FASTER DRILLING in soft shales results when using the drag bit. At left is side view of a new drag bit. At right is top view.

Since Spindletop, rotary drillers have adopted a lot of new tools and thrown away a lot of old ones to keep stepping up drilling rates. One tool thrown away was the drag bit. That may have been a mistake.

THE DRAG bit is a better tool than most think. True, the vastly improved rock bits of today make it a tool of very limited application but it still may have a place. Many a young engineer has got a shock when he looked back on well records of 20 years ago and found drag bits then drilling soft shales faster than rock bits do today.

Of course, no one would suggest going back to the drag bit in hard formations. Still, there is a lot of soft-formation, top-hole digging done now that probably could be done cheaper with drag bits than with rock bits. You would have to pick the area very carefully, but it could save money.

It's being done . . . One place where drag bits are paying their way is South Texas. A few contractors and operators are using drag bits in fields where they know the formations well enough to know which are right for them. They use drag bits through these formations and usually drill faster than they could with rock bits. As a result, the cheaper drag bits make hole cheaper.

Table 1 shows the results Humble Oil & Refining Co. got drilling with drag bits in four Southwest Texas fields. In these fields, it had been customary to use rock bits, but drag bits raised penetration rates from 24.5 per cent to 71.3 per cent. In another field not shown in the table, Humble cut rotating time by 33 per cent by using drag bits to drill to 6,500 ft.

A South Texas drilling contractor reports that he runs two drag bits in each well of one particular area. In this way, he makes hole faster and drills cheaper than he could with rock bits. This contractor says, however, he never runs a third drag bit in these wells; to do so would carry the hole into formations too hard for drag bits and all previous gain could be lost.

Bits and hydraulics . . . The benefits of a good hydraulics program apply to drag bits just as much as to rock bits. In fact, the first jet-bit work was done with drag bits. Sizing nozzles is a simple matter of using two jets of the same total cross-sectional area as the total of the three jets in a rock bit.

During the time that Table 1 was compiled by Humble, the company was raising hydraulic horsepower of its rigs as shown in Table 3. The higher horsepower came either from proper liner selection or from compounding the pumps and made it possible to raise bit weights considerably before the bit reached its ball-up point. And, higher bit weights mean faster drilling. In one 8,000-ft. well in which drag bits were used, compounding the

TABLE 1—COMPARISON OF DRILLING OPERATIONS USING ROCK BITS AND DRAG BITS

			Wells drilled using rock bits					Wells drilled using drag bits					Increase (%)	
				No. of bits		Penetration rate,	Avg. bit		No. of bits		Penetration rate,	Avg. bit	Penetration	Bit
Field	Interval, ft.	Hole size, in.	Well No.	Rock	Drag	ft./hr.	life, ft.	Well No.	Rock	Drag	ft./hr.	life, ft.	rate	life
A	1,500-6,500	7⅞	1	11	0	36.6	459	1	1	7	62.7	623	71.3	36.4
A	1,500-7,000	7⅞	2	14	0	34.1	396	2	2	7	48.8	610	43.1	54.1
A	1,500-7,200	7⅞	3	15	0	32.2	381	3	6	10	40.1	355	24.5	−6.8
A	1,500-6,600	7⅞	2	12	0	36.0	431	4	3	8	54.8	462	52.3	+7.2
B	1,020-5,750	9⅞	4	3	0	55.7	1,565	5	1	3	82.8	1,180	48.7	−24.6
B	1,020-5,750	9⅞	4	3	0	55.7	1,565	6	2	2	77.0	1,173	38.2	−25.1
B	1,020-5,750	9⅞	4	3	0	55.7	1,565	7	1	2	87.2	1,565	56.5	0
B	1,020-5,750	9⅞	4	3	0	55.7	1,565	8	1	4	69.5	945	24.8	−39.6
C	2,600-5,400	12¼	5	4	0	14.7	598	9	1	2	24.4	932	66.1	55.8
C	1,540-6,750	9⅞	6	7	0	37.6	742	10	0	7	52.1	744	38.6	0
C	1,540-5,750	9⅞	7	3	1	53.3	1,052	10	0	4	69.0	1,050	29.4	0
D	1,460-8,000	9⅞	8	14	0	18.4	459	11	1	14	26.6	436	44.5	−5.0

pumps saved 134 rotating hours compared to single-pump operation.

Although the higher hydraulic horsepower generally resulted in higher daily rig-maintenance expense, this was more than offset in most cases by the faster drilling rate. So, on a footage basis, drilling was cheaper.

The Humble study described here was the result of a detailed engineering study to improve rig operating efficiency. In this particular case, the study showed that use of more drag bits and raising hydraulic horsepower would help. Other improvements were also made. Final result of this overall study was the higher drilling rates for all rigs as shown in Table 3.

How about crooked hole? . . . One reason that's always given for not using drag bits is that rock bits drill straighter hole. That is true, but soft formations are not generally the most severe about crooked hole. To check hole deviation, Humble studied wells in a South Texas area drilled during a recent 8-month period. Table 4 gives the results.

Rock bits did drill straighter hole. However, the company had no added expense because of hole deviation while using drag bits.

Rock-bit-drilled holes had a deviation of less than 1° in three-fourths of all measurements and only one measurement was greater than 3°. While only about half of the deviations with drag bits were less than 1°, only 5 were higher than 3°.

Big drill collars and a close watch on bit weight will help keep deviation with drag bits within limits. In South Texas, some use two or three "oversize" collars on the bottom of a normal collar string to keep hole straighter.

No "twistoffs" reported . . . Drag bits put more torque in the drill string than do rock bits. And, compared to the smooth roller action of the rock bit, the drag bit really runs rough on bottom. For these reasons, a lot of early-day "twistoffs" were attributed to use of drag bits. Perhaps the drag bits were in a very small way contributing to drill-pipe failure. Still, it's doubtful that much of the trouble lay with the drag bits.

Most pipe experts insist there is no such thing as a pure twistoff. They say that an ordinary rotary table couldn't possibly put enough torque on the drill string to twist a joint of pipe in two. The pipe really fails from fatigue. When a fatigue crack develops, mud washes the crack out until the pipe parts.

Actually, the underlying cause of most fatigue and twistoffs was running the pipe in compression. So, as soon as it became general practice to run enough drill collars to keep the pipe in tension, the number of twistoffs dwindled. Also, most rigs of today use larger drill pipe than in years gone by. Where 3½-in. drill pipe was the standard before, 4½-in. and 5-in. are common now. Of course, the larger pipe is stronger and failures are fewer with it.

In the 8-month study already mentioned, Humble had no twistoffs reported although the number of drag bits and weight on bit were both higher than before.

Need uniform weight on bit . . . Drillers who have always drilled with rock bits may need time to get accustomed to drag bits. There is more vibration and noise with drag bits and this is disturbing to some. Moreover, the driller can't slack off a lot of weight and leave the brake; likely this will lock the bit on bottom, the drill pipe will "wind up," and the rotary table will stall out. With a drag bit, the driller must feed the line off smoothly so there's little variation in bit weight.

One feature drillers like about the drag bit is being able to tell when it is dull. Most drag bits now used have wear indicators. When the blades are worn down, this wear indicator pops out a plug in the bit. At the surface, the driller can tell the plug is out because pump pressure drops. Knowing the bit is dull is important to the driller for two reasons: First, a dull bit drills slowly; second, a dull bit will let the hole go crooked quicker.

In South Texas, the companies have found that high-water-loss muds (15 to 20 cc.) help speed up drilling rates with drag bits.

TABLE 2—COMPARISON OF AVERAGE PUMP HYDRAULIC HORSEPOWER DEVELOPED ON COMPANY RIGS IN SOUTHWEST TEXAS DIVISION

Company rig number	Last quarter 1956	Current operations, second quarter 1957	Increase, per cent
8	421	645	53
11	340	578	70
12	460	544	18
14	456	531	16
44	530	810	53

TABLE 3—COMPARISON OF PENETRATION RATES, DECEMBER 1956 THROUGH MAY 1957

Rig No.	Field	Penetration rate: Previous, ft./hr.	Penetration rate: Current, ft./hr.	Per cent increase
1	A	30.6	40.6	33
2	B	52.5	62.4	19
3 and 4	C*	4.6	6.3	37
5	D	15.7	23.9	52
6	C†	20.2	26.6	32
7	E	59.3	87.0	47
7 and 6	F	17.8	42.3	137

*Diamond-bit versus rock-bit operation. †Air-drilling operation comparison.

TABLE 4—HOLE DEVIATION, ROCK BITS VS. DRAG BITS

(Based on 169 deviation measurements in comparable wells)

Deviation degrees	Rock bits, per cent	Drag bits, per cent
0-1	77.6	48.8
1-2	10.6	20.2
2-3	3.5	14.3
3-4	7.1	10.7
4-5	1.2	3.6
5-6		2.4

HOLE DEVIATIONS HIGHER THAN MAXIMUM LIMIT ALLOWED IN CONTRACT OPERATIONS

Type bit:	Deviation, degrees	Depth, ft.	Hole size, in.	Drill-collar size, in.
Drag	6	6,630	7⅞	6¼
Drag	3½	2,219	7⅞	6¼
Drag	3½	2,700	7⅞	6¼
Drag	5	3,233	7⅞	6¼
Rock	4½	3,700	7⅞	6¼
Drag	5½	5,250	8⅞	8

Now is the time to cut your drilling costs USE JET BITS

HUNT HAS THEM!

HUNT JET BITS

with or without
Dull Bit Indicators

HUNT COMBINATION BITS ALSO AVAILABLE

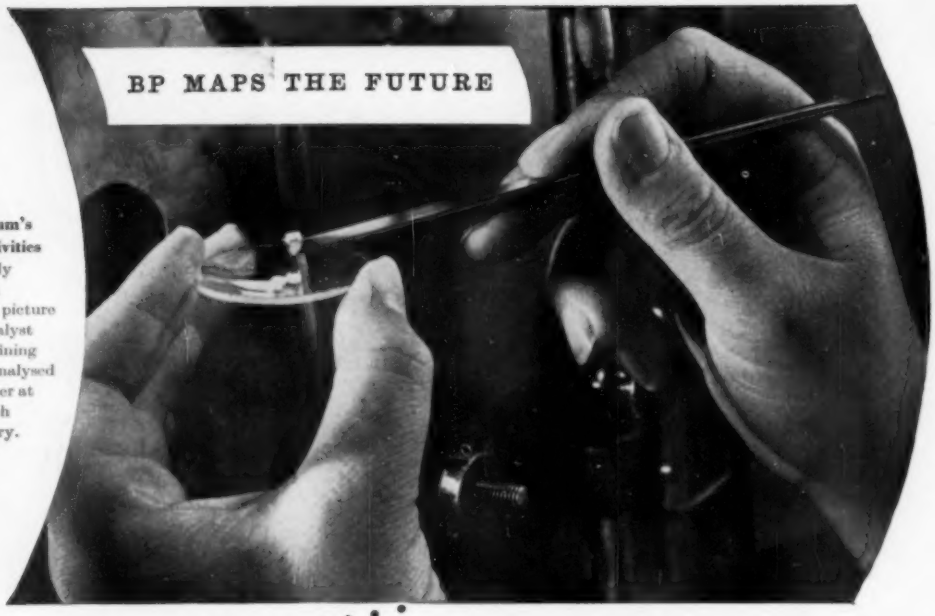
HUNT TOOL COMPANY

GENERAL OFFICES AND PLANT: HOUSTON, TEXAS
FIELD SHOPS: BAY CITY & CORPUS CHRISTI, TEXAS; JENNINGS & HARVEY, LA.
MARINE DIVISION: HARVEY, LA.
EXPORT SALES: HUNT EXPORT COMPANY, 19 RECTOR ST., NEW YORK
HOUSTON, TEXAS; BUENOS AIRES; PORT OF SPAIN; CARACAS

HUNT TOOL COMPANY

FISHING TOOL SERVICE

A BUSINESS BUILT ON *Good* SERVICE



The story of British Petroleum's world-wide activities begins, naturally enough, here in Britain. In this picture a sample of catalyst for use in oil refining is about to be analysed in a spectrometer at the BP Research Station, Sunbury.

How will these hands shape tomorrow's motoring?

WHOSE HANDS ARE THESE? They are the hands of a chemist at the research station of The British Petroleum Company at Sunbury-on-Thames. One of nearly 1,000 BP research workers whose main task is to conjure more and better products from one single substance—crude petroleum.

Among the many different users of oil products, no one has gained more than motorists and motor-cyclists from the work of these men and women. No one has more to gain in the future. To quote one example, BP Energol 'Visco-static', the all-weather motor oil which reduces engine wear by 80%, was a recent Sunbury triumph The result of many months of patient research.

In 1917 Sunbury Research Station began with a single modest house. Now it occupies 39 acres and is still expanding. Besides its laboratory and development work, Sunbury carries out the most exhaustive proving-tests of BP products and processes. The latest major addition to its resources is a motor fuels engine-test laboratory, where cars can be tested at speeds up to more than 100 m.p.h. under temperature and humidity conditions equivalent to the most extreme tropical climates.

Thus, constant research ensures the supreme quality of BP products for use all over the world, and even more efficient fuels and oils for the engines of tomorrow. At Sunbury, the future takes shape today.

THE *British Petroleum* COMPANY LIMITED

BP

Part 9 on storage stability. (Final).

The REFINER'S NOTEBOOK

Temperature Important in Storage

By F. G. Schwartz and C. C. Ward

THERE ARE INDICATIONS that drum storage at ambient temperature for 12 months is 1.4 times as severe as bottle storage at 110° F. for 13 weeks using insoluble gum as a criterion.

A comparison of soluble gum formed in bottle storage after 13 weeks at 110° F. with the soluble gum formed after 12 months in a drum at ambient temperature shows that drum storage for 12 months at ambient temperature is only 0.8 as severe as bottle storage at 110° F. for 13 weeks.

Light transmission of fuels stored in bottles at 110° F. for 13 weeks and in drums at ambient temperature for 12 months is approximately equivalent.

Comparison of samples of fuels stored in steel drums at ambient temperature with samples stored in bottles at ambient temperature and at 110° F. indicates a fairly definite trend. It appears that at ambient temperature drum storage is slightly more severe than bottle storage. A comparison of bottle storage at ambient temperatures for 1 year and at 110° F. for 13 weeks shows that, with soluble gum as a criterion, bottle storage at 110° F. for 13 weeks is a little more severe than storage at ambient temperatures for 1 year; with insoluble gum as a criterion, ambient-temperature storage is more severe. This is confirmed by data obtained in other studies which have shown that elevated temperature storage accelerates the formation of soluble gum more than insoluble gum.

The work described in the foregoing discussion substantiates the following conclusions:

Storage stability:

Normal Storage

1. Straightrun fuels are most stable, catalytically cracked fuels are intermediate in stability, and thermally cracked fuels are least stable.

2. Oxidation is a major factor in gum formation in distillate fuels during storage.

Authors are with Petroleum Experimental Station, Bureau of Mines, USDI, Bartlesville, Okla.

Storage with Contaminants

3. Formation of both soluble and insoluble gum is accelerated by the same conditions.

4. The reaction of component fuels to different contaminants in storage is still evident in blends of those fuels.

5. Iron did not catalyze gum formation in any fuel or blend studied.

6. Copper catalyzed gum formation in all three types of fuel; however, some straightrun fuels and catalytically cracked fuels were not affected appreciably.

7. Storage in contact with copper and sea water was the most severe storage condition studied.

8. The presence of sea water with copper usually contributed very decidedly to the instability of the fuel or blend. Contact or mixing of the fuel with sea water should be minimized especially if copper may be present.

9. A number of fuels were sensitive to contact with galvanized iron and sea water, especially after 26 weeks of storage.

Incompatibility:

10. Fuels when blended may be compatible, incompatible, or supercompatible.

11. Incompatibility appears to be characteristic of certain fuels as they are incompatible in most of their blends.

12. No evidence of **immediate** incompatibility was noted in any blend.

13. A fresh fuel is compatible with the same fuel after aging.

14. Pairs of fuels that are incompatible contribute to incompatibility if used in other blends.

15. Certain fuels appear to contain natural inhibitors that improve compatibility.

16. At the end of 39 weeks, incompatibility was evident in 32 of 67 binary blends.

17. The most incompatible (not necessarily highest gum) blends are blends of straightrun and catalytically cracked fuels. About two-thirds of the blends of this type were incompatible.

18. About one-half of the blends of straightrun and thermally cracked fuels and of catalytically cracked and thermally cracked fuels were incompatible.

19. The components of a straightrun fuel-cracked fuel blend determine the proportion at which maximum incompatibility exists. This proportion may vary greatly in blends of different fuels and therefore cannot be predicted other than by experiment.

20. The degree of incompatibility of a blend of a straightrun and a catalytically cracked fuel depends upon the composition of the straightrun fuel as well as on that of the cracked fuel.

21. Blends of two straightrun fuels and blends of two catalytically cracked fuels are compatible in most cases.

22. The addition of 20 per cent thermally cracked fuel to a blend of straightrun and catalytically cracked fuels does not affect appreciably the compatibility of the blend.

23. There is no appreciable incompatibility between several catalytically cracked fuels and pure hydrocarbons as represented by a paraffin, olefin, tetralin, decalin, naphthalene, and aromatic.

Stability prediction:

24. No combination of data now available has been found that will permit consistent prediction of storage stability of fuels or blends.

25. Elevated - temperature - storage procedures accelerate soluble-gum formation more than formation of insoluble gum.

26. Storage in vented bottles at ambient temperatures, and in vented steel drums at ambient temperature is very nearly equivalent. Drum storage appears to be slightly more severe.

27. Bottle storage at 110° F. for 13 weeks is approximately equivalent to either drum or bottle storage at ambient temperature for 1 year.

References

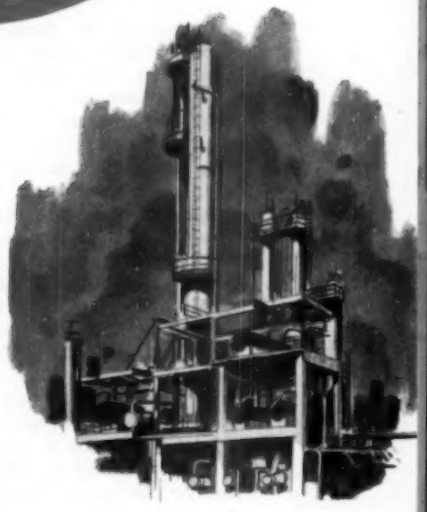
1. Eccleston, B. H., Morrison, M., and Smith, H. M., Anal. Chem. 24, 1745, 1952.

2. Ward, L. F., Jr., Moore, R. T., and Ball, J. S., Anal. Chem. 25, 1070, 1953.

Consistency

is TRADITIONAL at WESTERN

Consistency
is vital to
HF ALKYLATION



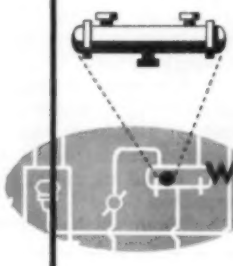
In this commercial use of hydrofluoric acid as a catalyst for the alkylation of olefins with isobutane, *consistent high quality of product* is of paramount importance in this well-established process.

HF Alkylation for the production of high octane motor fuel blending components demands *equal consistency* in the performance of the heat transfer equipment used to cool the reacting streams.

Western Heat Exchangers are characterized by consistency throughout their design and manufacture—from initial rating to completed fabrication.

Whatever the heat transfer requirement of your process, a proposal from Western should be your first consideration.

Water cooling of reacting streams is being efficiently handled by Western exchangers in many HF Alkylation units currently in operation.
There is a Western representative ready to serve you—**today.**



WESTERN
HEAT EXCHANGERS
WESTERN SUPPLY COMPANY
P. O. Box 1888 – Tulsa, Oklahoma

How to estimate Wax Content of Lube Stocks

By W. L. Nelson
Technical Editor

Can you suggest a method of estimating wax content from common properties of crude oils? F.S.T.

High-boiling portions of crude oils are so hard to evaluate that not entirely satisfactory methods are available. The oil must be analyzed if conclusive results are to be obtained. It is obvious, however, that there is a relationship between the amount of wax and the decrease in the characterization factor that occurs when the oil is dewaxed. Such a relationship is indicated by the dashed lines of Fig. 1 labeled "Upper" and "Lower" limits. The wide range is caused by the range of characterization factor exhibited by paraffin wax. D. Tull, in his master's thesis entitled, "A Study of High Viscosity Index Oils" (University of Tulsa, 1953) gives experimental data which indicate a range from 12.0 to 13.65 in characterization factor. The higher the wax content, the higher is its characterization factor but the relationship is not precise. Some of Tull's data were published on the March 29, 1954, issue of this page ("Effect of Dewaxing on Viscosity Index").

In all crude oil that contains large amounts of wax, it has been noted that the characterization factor is higher in the lubricating-oil fractions than in the middle-distillate fractions. Of even greater significance, the characterization factor of dewaxed lube fractions is nearly the same as the characterization factor of the middle-distillate fraction. The last-named relationship was used in obtaining the curve (Fig. 1) labeled "Experimental." The curve applies to lube fractions that boil between 700°-900° F., i.e., wax distillate. The greater the difference in the characterization factor at 750° F. and at 550° F., the greater the amount of wax. This is not as good a relationship as the difference in the characterization factors of the waxy and dewaxed oil, but it is useful because wax content can be estimated from the data ordinarily available in a true-boiling-point analysis.

Tull's data for Venezuelan crude oils indicate the following relationship between the wax content of wax distillate fractions and the decrease in characterization factor when dewaxed:

$$W = 10.6 + 44.6\,[(C.F.)_s - (C.F.)_l]$$

in which:

W = weight per cent wax
$(C.F.)_s$ = characterization factor of waxy stock
$(C.F.)_l$ = characterization factor of dewaxed (0° F.) lube

Although the same general type of relationship must also be valid for the highest boiling or residual parts of a crude oil, adequate experimental data are not available. In general, the amount of wax in residual fractions is very much larger, often twice as much as in the 700°-900° wax-distillate fraction.

The characterization factors of the 750° and 550° F. fractions are also related most generally to the presence of low-pour-point lube oils (Low-Cold-Test Oils Are Rare, OGJ, June 20, 1955, p. 118).

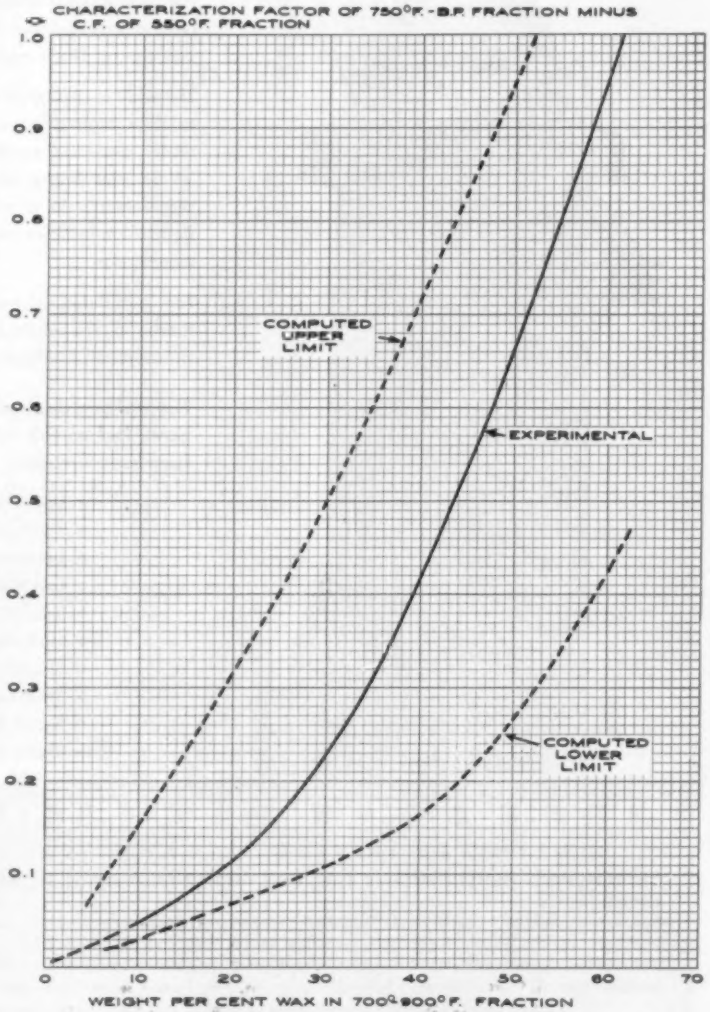


Fig. 1—Wax content of 700°-900° F. lube stocks.

ISOFLOW FURNACES NOW PROCESSING 300,000 b/d IN CATALYTIC REFORMERS

. . . and more "Isoflows" are being installed in the largest reformers under construction

The continuous production of high octane gasoline by catalytic reforming demands sturdy, efficient, soundly designed equipment. This is especially true of furnaces.

The wide acceptance of Petrochem-Isoflow furnaces is due to their high efficiency, dependable performance even under overload conditions, and their long service life. When you apply all the specifications and operating requirements to direct fired furnace design you'll find Petrochem-Isoflows most economically desirable, by any comparison.

For petroleum, chemical and allied process industries there's a Petrochem-Isoflow furnace for any duty, temperature and efficiency.

The unique design and operating features which have led to the wide acceptance of Petro-Chem furnaces include:

- Uniform Heat Distribution
- Maximum Fuel Efficiency
- Low Pressure Drop
- Low Maintenance
- Zero Air Leakage
- Minimum Ground Space
- Simplicity of Design and Construction
- Short Length of Liquid Travel
- Series, Multipass, all parallel flow
- Excess Draft for High Overload

PETROCHEM-ISOFLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INC. • 122 EAST 42nd St., New York 17, N. Y.

REPRESENTATIVES:

Kennedy & Co., Houston • Wm. H. Mason Co., Tulsa • Lester Oberholtz, Los Angeles • Parrilla-Levally, Chicago • D. D. Foster, Pittsburgh • Turbex, Philadelphia • Flagg, Brockett & Durgin, Boston • G. M. Wallace & Co., Denver & Salt Lake City

International Licensees and Representatives: SETEA-S.A. Comercial, Industrial, y de Estudios Tecnicos, Buenos Aires, Argentina • Industrial Proveedora, Caracas, Venezuela • Societe Anonyme Heurtey, Paris, France • Societe Anonyme Belge, Liege, Belgium • Petrochem G.M.B.H., Dortmund, Germany • Heurtey Italiana S.P.A., Milan, Italy • Birwelco Ltd., Birmingham, England

Help Filters Do Their Job

THE OIL LEVEL in the crankcase should be checked often to make sure the proper level is being maintained. The forced-feed lubricators should be filled twice a shift. At the same time each pump on each lubricator should be checked to make sure it is pumping oil. The one-shot lubricator should be operated once each hour. When the handle on the one-shot lubricator is pushed up it should come down very slowly. If not, the lubricator is operating improperly.

Filters for crankcase oil fall in two classifications: (1) the replaceable-element type and, (2) the multiple-plate type.

The replaceable-element filter contains a filtering material which becomes plugged with sludge from the oil. A clean filter will have a reasonably low pressure drop across it, but as sludge is picked up the pressure across the filter will increase to 20 psi. at which pressure the oil is automatically bypassed around the filter. The filter element must then be changed.

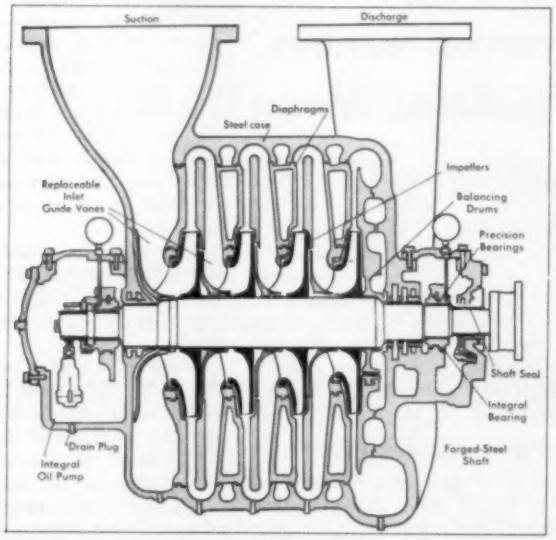
The multiple-plate filter is made of very thin plates. Half of the plates are stationary and remove sludge from the oil as the filtered oil flows between the plates. The other half of the plates slide between the stationary plates and dislodge the sludge which has collected. The clearing of these plates is done once each shift by the operator, who rotates a handle one complete turn in either direction. If the filter is stiff from accumulated sludge, work the plates back and forth several times until they work freely.

Filtering the oil removes sludge and increases the life of an oil; however, there are limiting values of viscosity and neutralization number that determine when an oil is to be discarded.

Samples are periodically checked by the laboratory and when the test results exceed the following values the oil is discarded:

DISCARD VALUES OF COMPRESSOR OILS

	Vis. S.s.U. at 100	Neut. No. mg. KOH/g. of oil
7075 Compressor oil	850	3.0
Barosa 56	600	1.0
WS-2277	1,200	5.0



CENTRIFUGAL COMPRESSOR has pressure lubrication for bearings. Fig. 14.

Centrifugal compressors . . . Centrifugal compressors are equipped with pressure lubrication for the bearings (see Fig. 14). The oil pump may either be driven by the compressor shaft or a separate pump and driver may be used. If the pump is driven by the shaft it is usually mounted inside of the case of the compressor. In this design the oil level is shown by a gage glass mounted on the case. The oil level should be checked at least twice each shift.

Storage of lubricants . . . Proper containers and facilities for storing lubricants are essential for good lubrication. One of the principal causes of bearing failure is foreign material such as grit, dirt, rags, water, etc., finding its way into the oil or grease. Usually this foreign material gets into the lubricant during storage. To prevent this, containers should be covered at all times and kept in a special cabinet.

Drums containing oil or grease should either be mounted on racks which allow them to be turned on their side or tilted by placing some object beneath one edge of the drum. This is to prevent dirt and water from accumulating on top of the drum and being drawn inside by the breathing action which takes place as the temperature changes.

Lubrication by Personnel

Operating personnel are responsible for:

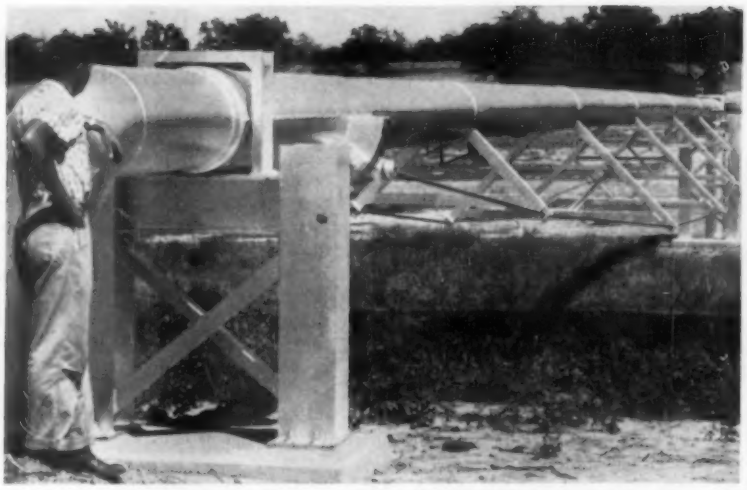
1. Maintaining oil levels in the crankcase, sump, or mechanical lubricator of all oil-lubricated pumps, motors, blowers, turbines, reduction gears, and similar types of equipment.

2. Oiling or greasing equipment such as steam-pump linkages, conveyors, etc., which require frequent applications of oil or grease. This does not include grease-lubricated main bearings on motors, centrifugal pumps, turbines, or blowers which are lubricated at relatively long intervals.

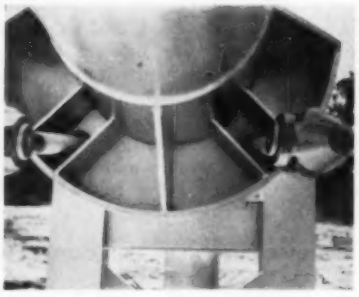
3. Ordering and storing all oils and greases used at the unit.

4. Storing oil cans and grease guns when not in use. A special cabinet is provided for this purpose.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.



Specially designed spans for deep gully crossing . . .



are supported by trusses and two heavy cables.

New overhead spans are among several interesting construction features of Natural Gas Pipeline's gathering system

By Paul Reed
Pipeline Editor

This is the second in a series of articles describing a pipeline-laying project by Natural Gas Pipeline Co. of America, from Bridgeport to Fritch, Tex. Part one (page 98, Dec. 9 issue) discussed how the pipeline was protected in three separate sections by using three different pipe-coating methods. Mill-coating of pipe with asphalt is described here.

FEATURES of the operations for constructing the gathering system for Natural Gas Pipeline Co. of America include measures for handling the asphalt mill-coated pipe, welding, ditching, building of erosion dams, specially designed overhead span crossings, and the submerged crossing at Lake Bridgeport.

Work contracted by Fulton & Brodie, Inc., started last winter on dams and spans before pipelaying began. Pipelaying will continue until the spring of 1958. The original estimate of 130 miles has been raised to 140 miles of gathering lines plus 12 miles of 20-in. pipe as the beginning of the main line. Pipe is largely of 4 and 6-in. diameter. Most of the 4-in. is for single well connections. The remainder is 10, 12, 16, and 20-in.

Asphalt-Coated Pipe

Since all of the pipe in diameters of 4, 6, 8, 10, 12, and 16-in. diameter is delivered to the job as asphalt mill-coated pipe, special care must be given to its protection while in transit from the railhead to the right-of-way.

Bolsters of the stringing trucks are padded with rubber tires to prevent injury to the coating. Additional padding on the stringers is provided by using excelsior padding 6 in. wide and 1 in. thick wrapped with kraft paper. This is taken from the railroad cars where it protects the coated pipe in transit to the railhead. Special care is taken in unloading from railroad cars and from stringing trucks. At the right-of-way, coated joints are put on skids and padded with gunny sacks to keep them off the ground.

Handling of pipe in the line is done with rubber-tired cradles.

After completion of welding, hot asphalt is applied at the field joints where the pipe has been left bare for a distance of 4 in. at the end of each joint of pipe. On 4-in.-diameter pipe, the hot asphalt is "ragged on" first with felt and then the joint is wrapped with glass mat prepared for this purpose with a tough coating of asphalt. Pipe of 6, 8, 10, 12, and 16-in. diameters is ragged with asphalt in the same way and then covered with a prepared wrapping of glass mat and kraft paper.

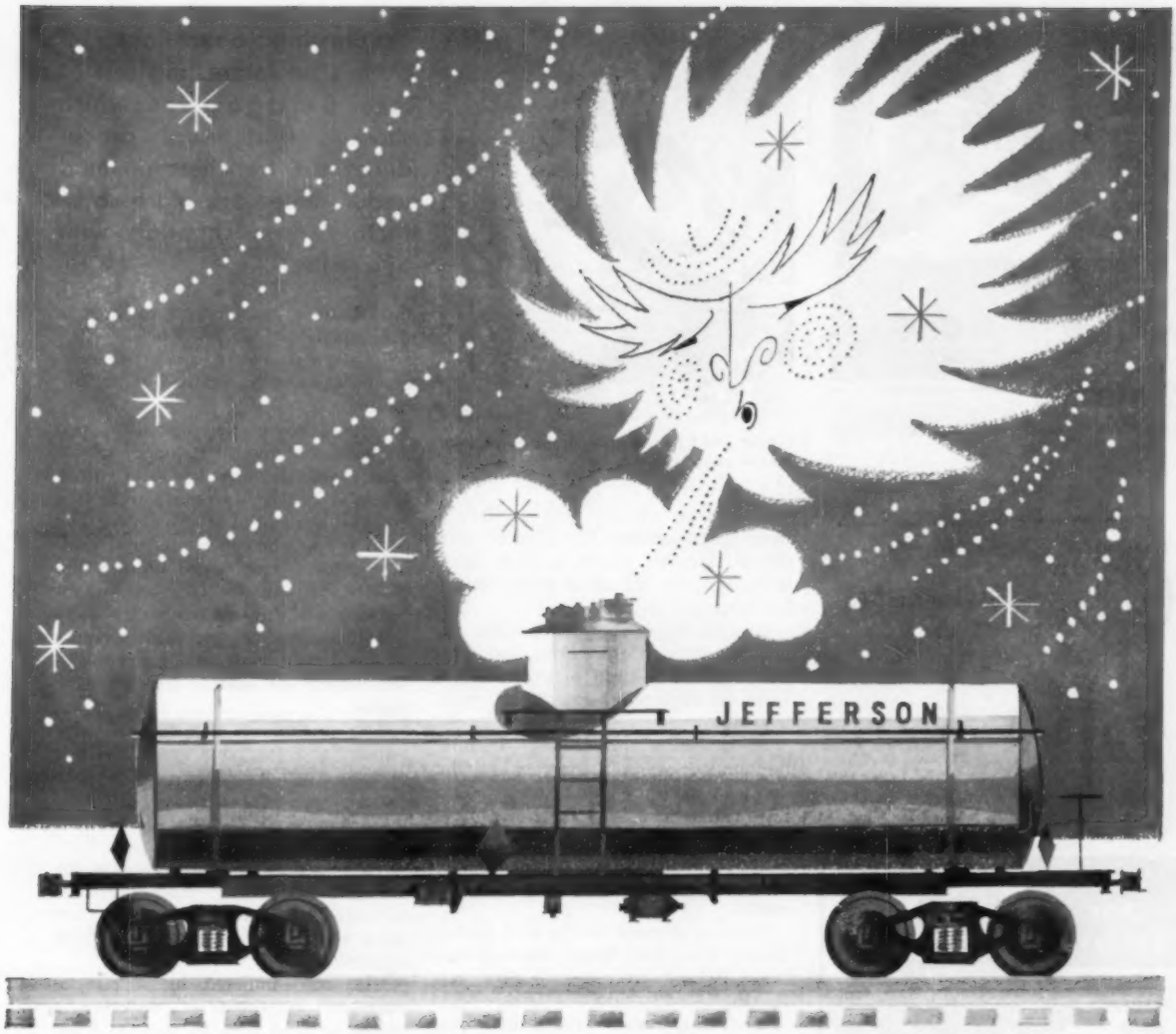
Pipe of 16-in. diameter and below is cradled into the ditch with a rubber-tired cradle. Field joint crews are about half a day ahead of lowering in.

Since the 12 miles of 20-in. laid by the gathering system spread is field coated with asphalt, it is not cradled into the ditch but is laid on skids.

Condition of the asphalt coating was found to be more satisfactory when the type of wrapping was changed from asbestos to kraft paper.

Erosion-Control Dams

Dams to check erosion have been built at 13 locations in the gathering-



If you have a **THAWING PROBLEM** *with*

ETHANOLAMINES

. . . then why not solve it by simply contacting your nearest Jefferson office? Our know-how on tank car and drum thawing techniques should reduce your difficulties to a simple handling routine.

Better yet, you may benefit from the use of our insulated, preheated tank wagons and completely eliminate *all* the problems of thawing!

For a very complete discussion of Ethanolamine unloading, storage and handling, send for a copy of our Technical Bulletin *Ethanolamines.*

Jefferson Chemical Company, Inc., 1121 Walker Ave., Houston 2, Texas.

Essential Chemicals from Hydrocarbon Sources

HOUSTON • NEW YORK • CHICAGO • CLEVELAND • CHARLOTTE • LOS ANGELES

Jefferson
CHEMICAL COMPANY, INC.

Completely Air-Conditioned
Centrally Located
Adjacent Garage

BUSINESS and PLEASURE
in TULSA means . . .

THE MAYO
LD 381 TULSA's world-famous HOTEL

Write for Bulletin
PATENTED
NAME OR EMBLEM
PIPE LINE GAS
PIPELINE VENTS AND MARKERS
FLEET-LINE CO.
P. O. BOX 276-B
SHREVEPORT
LOUISIANA

TO CHANGE YOUR ADDRESS

IT'S BEST . . .
to send your old address clipped from the Journal mailing wrapper along with your new location.

ADVANCE NOTICE . . .
10 days before you move, and we guarantee you week-to-week undelayed service.

WRITE . . .
Circulation Department
THE OIL AND GAS JOURNAL
Box 1260 Tulsa 1, Okla.

DROP INLET is used to drain water from behind erosion dam.

system area. These vary in length from approximately 300 to more than 600 ft. Heights are 10 to 15 ft. Such dams are always built at points downhill from the pipeline.

By building erosion dams while the line is under construction, the company can be assured of protecting it from the beginning against undermining.

"Drop inlets" provide for draining impounded water from behind the dams at such a rate of flow as to insure that the dam will neither overflow nor be undermined. In time the area behind the dam will silt up and eventually the dam will need to be raised.

Grass is planted on the dam immediately after completion and a strong fence is built around it to keep cattle off.

The drop inlets are drain pipes, mostly of 30-in. corrugated galvanized-iron pipe of a type used for culverts. A 5-ft.-square galvanized iron shield is placed on the pipe within the dam to prevent water from washing out a hole around the pipe.

Overhead Spans

Wide creeks are crossed by overhead spans specially designed by the company. By the use of a series of trusses supported on two heavy cables in tension the pipe is held in compression.

Possible future movement of the pipe span would be restrained by a frame at the top of the tower at each end of the span. Initially, the pipe is not in contact with the top of the tower and the frame surrounding the pipe.

The advantage of this type of span is economy of construction and future maintenance.

An insulating pad of asbestos felt is placed between the concrete foundation and the base of the steel frame

"Blasting operations included an interesting test at Lake Bridgeport which showed that usual procedures for trenching in mud under water are more satisfactory than shooting with dynamite."

or "tower" at each end of one of these spans.

Exposed pipe at the span-type overhead crossings is painted with aluminum.

Approaches of the pipe to a span are protected for 40 ft. on each side by a plastic paint applied cold with a brush. This is the company's first use of this material to any extent. The paint is furnished in winter and summer grades. Experience on this job showed that the winter grade cannot be used in warm weather.

Two coats of the cold coating wrapped with glass mat are applied, followed by an outside coat of black mastic.

This material is also used at valve settings and for painting the outside of road-crossing casings.

Blasting

Blasting operations included an interesting test at Lake Bridgeport which showed that usual procedures for trenching in mud under water are more satisfactory than shooting with dynamite.

The test—initiated by a powder company—consisted of shooting a trench in mud with 14 tons of dynamite across Lake Bridgeport. There was no rock in the lake crossing. Since the blasting of mud was ineffective, drag lines had to clam out the trench to finally get the job done.

Lake Bridgeport had been formed by flooding, which raised the water 50 ft. The total length of the river pipe at the crossing for the submerged line and approaches is 1,320 ft.

A 10-mile stretch of the right-of-way across limestone (solid rock) was shot for the entire length.

Through rock the line is padded with dirt above and below the pipe and the pipe is also protected by rock shield.

Welding

This is a "rig job." All welders including stringer bead, hot pass, and utility welders furnish their own welding machines and mobile equipment such as trucks and pickups. The contractor furnishes no welding rigs for the job.

Two stringer-bead and two hot-

ALL FORGED STEEL

Edward

STOP AND CHECK VALVES

For Pressures Up To 7500 lbs

Rated for 7500 lbs at 125F in 2 in. sizes, and for 6000 lbs at 125F in the ½ to 1½ in. sizes, Edward's complete line of all forged steel high pressure valves are used in thousands of applications involving excessive pressures and temperatures under 300F. Fig. 158 stop valves, in either globe or angle styles, provide fast, certain shut-off or accurate pressure control. Fig. 160 check valves protect costly equipment, eliminate danger by preventing sudden reversal of flow.

FIG. 158

Construction Features Like These Give Longer Life, Reduce Replacement Costs And Lower Maintenance Time:

FIG. 158 STOP VALVES

- Drop forged steel bodies specially heat treated.
- Stem at 60 degree angle to reduce wear producing turbulence, lower pressure drop.
- Seat, disk, and stem of EValloy 13% chromium stainless steel.
- Renewable screwed in seat with long threads below pressure joint for leak proof seating.
- Inside screw construction, deep stuffing box and special gland and packing nut design to lengthen packing life.
- Bonnets EValized by exclusive plating process for maximum corrosion and abrasion resistance.
- Body contours streamlined for free flow with low pressure drop.
- Stem of EValloy stainless steel, centerless ground to fine finish, long wearing Acme form threads, backseating shoulder.

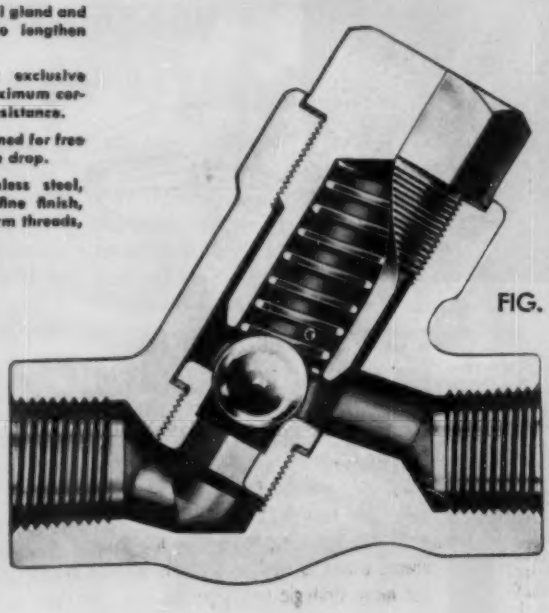


FIG. 160

FIG. 160 CHECK VALVES

- Body and seats identical with globe or angle valves above.
- Rolled steel bonnet with two ribs for guiding ball to accurate seating.
- Balls of corrosion resistant, high carbon stainless steel accurately ground for tight seating.
- High Carbon stainless steel springs, sufficiently long to provide positive aid in seating ball in services involving heavy viscous fluids.

Available in Wide Range of Sizes and Styles

- Stop valves furnished in globe or angle styles.
- Check valves furnished in horizontal or vertical styles.
- All valve styles furnished in sizes ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2".
- All valve styles furnished with either screwed or socket welding ends.

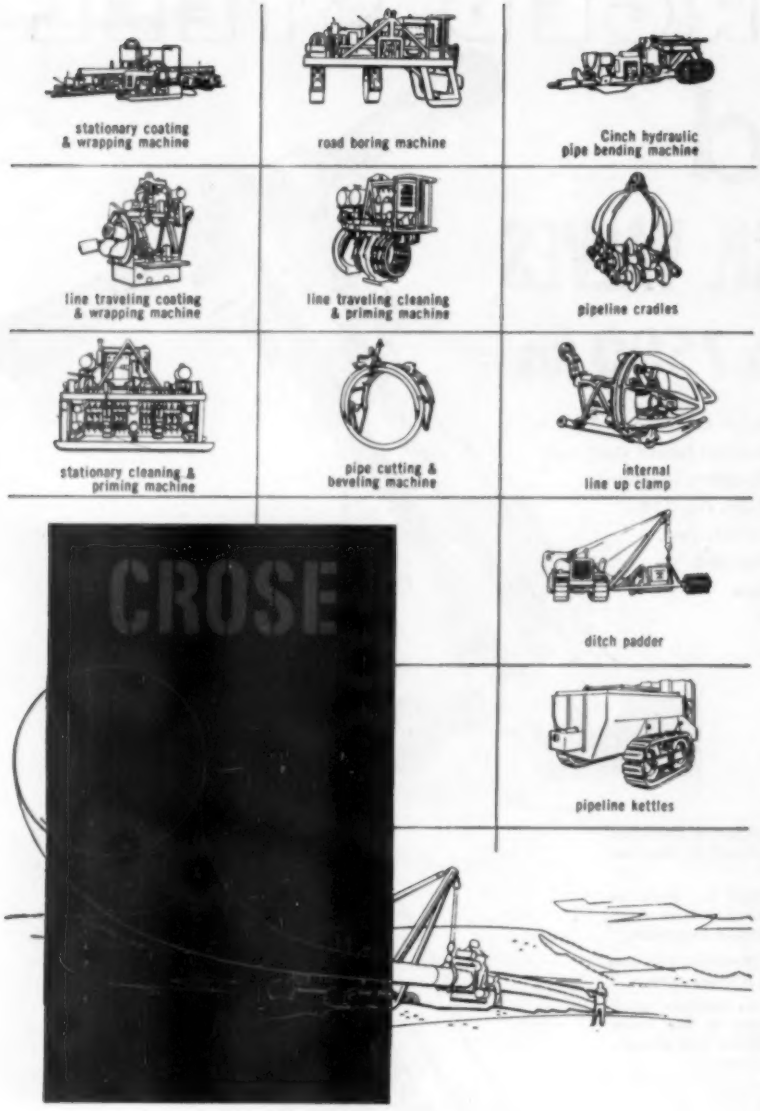
Edward builds a complete line of cast and forged steel valves for pressures from 150 lbs to 7500 lbs, including globe and angle stop valves, gate valves, non-return valves, blow-off valves, feedline stop-check valves, integral bonnet Univalves, relief valves, hydraulic valves, instrument valves, gage valves and strainers. Write for Catalog 104.

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

1212 West 145th Street, EAST CHICAGO, INDIANA

Another Product



A COMPLETE EQUIPMENT LINE FOR PIPELINE CONSTRUCTION

The world-wide pipeline construction industry looks to Crose for the most complete line of equipment. Industry experience has proved that Crose equipment is outstanding for efficiency, operating economy — and it is always closer to work in progress because of our many strategic supply points.

New York, N. Y.
Ph. BRyant 9-2236
*Denver, Colorado
Ph. EMpire 6-0332
*Houston, Texas
Ph. MIssion 5-2484
*Newark, N. J.
Ph. MArket 4-3650
DISTRIBUTOR:
CROSE-CURRAN LTD.
*Edmonton, Alberta
Ph. 3-5135
*Winnipeg, Manitoba
Ph. SPruce 4-1851
*Warehouses in 5 locations

Crose
MANUFACTURING COMPANY, INC.
2715 Dawson Road • Tulsa, Oklahoma • Ph. MAdison 6-2171

pass welders work on 12, 16, and 20-in. pipe. For these diameters internal line-up clamps are used.

On the smaller diameters—4, 6, and 10-in.—there is one stringer-bead welder and one hot-pass welder. External line-up clamps are used on pipe of these sizes.

Firing line for the project varies from three to eight welders.

In addition to the welders in the pipe gang and firing line there are welders in three tie-in crews and a meter crew.

An effort is made to keep the firing line up to two or three welds behind the hot pass.

Work is done in 10-hour days, 7 days a week except by welders in the pipe gang and on the firing line. Tie-in welders and welders for special jobs may work on Sunday.

All of the pipe for the gathering system was furnished with a 37½° bevel except the 12 miles of 20-in. which came with a bevel of 30°.

Comparison of welding with the 37½° and the 30° bevel on the same project, was reported to show that more attention needs to be given to proper spacing with the 30° than with the 37½° bevel. Furthermore, hot-pass welders can clean out the slag better with 37½° than with 30° bevel. Final result in the completed weld is said to be better quality in the weld of pipe beveled 37½°.

The same procedure for hot-pass welders has been for the 20-in. pipe with 30° bevel as for the smaller diameters with 37½° bevels.

This procedure consists of having each of the two hot-pass welders perform a different function. The first one runs over the stringer bead lightly for the primary purpose of stress relieving to prevent cracking. The other hot-pass welder follows to clean slag and eliminate defects in metal deposit of the stringer bead.

Most companies and contractors in the pipeline industry favor the 30° bevel. Currently a bevel as narrow as 20° is being tried on a pipeline project.

However, Natural Gas Pipeline Co. of America has preferred the 37½° bevel for a number of years when it has procured a quality of welding which is superior and more satisfactory to the company than that obtained with the smaller bevel.

While the contract for X-ray inspection calls for photographing only 30 per cent of the welds, actually 40 per cent have been X-rayed. All X-rays are made with an X-ray machine inside the pipe except on the 10-in. where outside X-raying has been done.

Natural Gas Pipeline Company of America Finds GAS LINE LIKE NEW AFTER 27 YEARS!

Bitumastic coal-tar enameled pipe to be re-used

In relocating its line to make way for a new highway near Truro, Iowa, the Natural Gas Pipeline Company of America removed some 900 feet of Bitumastic® enameled pipe laid in 1930. According to Mr. D. C. Allen, District Superintendent, this 24-inch seamless steel tubing is in such good condition that it will be reconditioned and used again as new pipe.

Applied by the rolling and "granny-rag" method in 1930, the Bitumastic XXH Enamel on this line was in excellent condition. The asbestos-felt overwrap, originally applied loose, was torn from soil stresses, but the Bitumastic enamel coating showed no serious disbonding or deterioration. At the time of relocation, the section had been under cathodic protection for two years. Natural Gas Pipeline Company of America records show no corrosion leaks on this section during the entire 27-year period underground.

Case histories such as this from prominent pipeline companies prove the unmatched protective ability of coal-tar enamel. In these days of rising material costs, you can't afford to gamble your entire pipeline investment on a less effective coating.

Your Koppers representative will be glad to give you full information on the superior protection of Bitumastic coal-tar enamels. Koppers District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh, and Woodward (Birmingham), Alabama.

104K

KOPPERS

BITUMASTIC
REG. U. S. PAT. OFF.
PROTECTIVE COATINGS

NEW PLANT...NEW BRANCHES FOR BETTER-THAN-EVER GRANT SERVICE!

In LOS ANGELES... a new main office and plant to turn out the constant flow of Grant Tools for world-wide drilling operations—

In ODESSA... LAFAYETTE... new branch plants for fast, efficient Grant field service—

With these new facilities, *coupled with twelve other field locations in active oil territory*, Grant Tools and Grant Service are more than ever ready for your call day or night—on any well, anywhere!

GRANT VERTICAL CASING SCRAPER

GRANT
OIL TOOL COMPANY

Main Office and Plant:
2042 EAST VERNON AVENUE, LOS ANGELES 58, CALIFORNIA

CALIFORNIA • WYOMING • FOUR CORNERS • NEW MEXICO • TEXAS • OKLAHOMA • LOUISIANA • NEW YORK

Among the Drilling Contractors

Canadian Contractors Survey Wage Scales

A survey by the Canadian Association of Oilwell Drilling Contractors reveals that wages paid drilling crews in western Canada average approximately $2.70 per hour for drillers, $2.02 for derrickmen, $1.98 for motormen, $1.82 for roughnecks, and $1.74 for boilermen.

The survey covered 52 companies, whose hourly wage rates range from $2.05 to $3.42 for drillers, $1.60 to $2.51 for derrickmen, $1.85 to $2.51 for motormen, $1.50 to $2.26 for roughnecks, and $1.25 to $2.05 for boilermen.

Mechanics on rigs average $2.09 per hour when not paid on a monthly or weekly salary basis. Only 27 of the 52 companies in the survey reported mechanics, as such, on their payrolls. Thirteen of the twenty-seven employ mechanics on a monthly or weekly basis with monthly pay ranging from $325 to $600 and averaging $445. The hourly wage rate of the other 14 companies ranges from $1.35 to $3.00.

Columbia Drilling Co., Houston, is getting under way on a deep test it has contracted to drill for Ginther, Warren & Ginther at a wildcat location 3 miles northeast of Rock Island, in Colorado County, Texas Gulf Coast. The test, 1 Coleman, in SA&MG Survey 24, is 3¾ miles northeast of West Rock Island field. Operators are preparing to go at least to 10,000 ft.

Adkins Drilling Co., San Antonio, is on a deep contract job 3 miles southeast of Waelder, in northeastern Gonzales County, Southwest Texas. It is a 9,500-ft. test for Carter Foundation Production Corp. at 1 Brubaker, in the J. C. Baker Survey.

Loffland Brothers Co., Tulsa, is drilling for R. Mosbacher and Continental Oil Co. at a wildcat location 5 miles east of Thibodaux, in Lafourche Parish, Coastal Louisiana. Location, at 1 Libby-Blevin, in 97-15s-17e, is about 3½ miles northeast of Rousseau field, nearest production.

Iraq Drilling Co., Tyler, has a rig under contract to James W. Fair, of Tyler, for a 5,900-ft. Woodbine test about 3 miles northeast of Elkhart, in southern Anderson County, East Texas. Location is for 1 Fincher, in the Phillip Martin Survey.

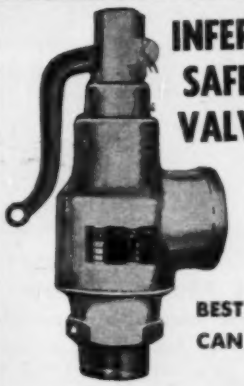
B. G. Byars Drilling Co., Tyler, Tex., is getting well down on a 7,500-ft. Paluxy test it is drilling for Grelling estate at a wildcat location 6 miles northeast of Tyler, in Smith County, East Texas. Location, at 1

ON THE FLOOR of Arrow Drilling Co.'s rig which is putting down Western Canada's deepest test, a contract operation for British American Oil Co., Ltd., at Lambert Creek, 55 miles northeast of Jasper, in western Alberta (OGJ, Nov. 25, p. 373). Left to right: Dick Nault, floorman; Carmen Fairman, Continental-Emsco field representative; Jack Graham, driller; Orrin Montieth, derrickman; Warren Brooks, motorman; and Tom Spillway, floorman. The test is drilling below 15,000 ft.

Protects threads—prevents galling and seizing—gives tight seals—permits easy separation—lengthens drill string life. These are reasons why 'Bestolife Lead Seal Tool Joint and Casing Compound has been the standard of the oil country for over twenty-five years. Unconditionally guaranteed.

Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses the world over.

I. H. GRANCELL
1601 E. NADEAU STREET
LOS ANGELES 1, CALIF.



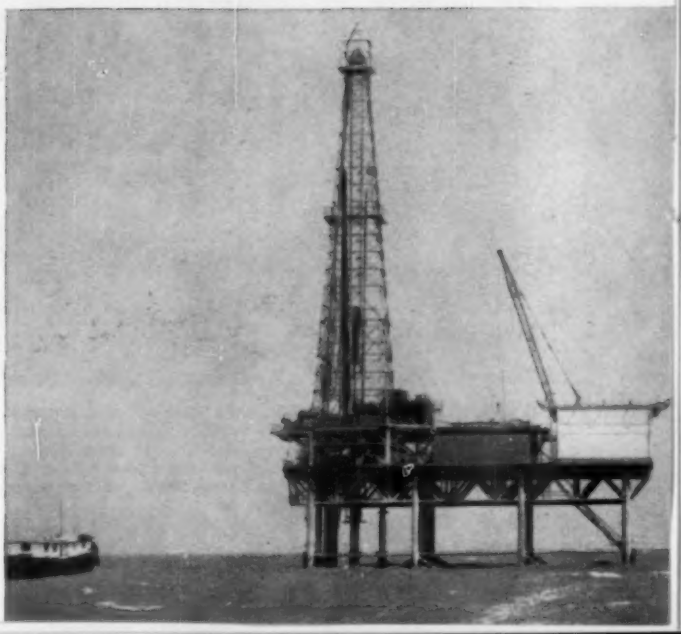
INFERNO SAFETY VALVES

BEST YOU CAN BUY

Inferno Steam Safety Valves have been time-tested for many years in the field, and firemen everywhere will tell you they are the most dependable valve made. For full particulars write for Bulletin 32.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

Gulf Marine's new submersible barge is powered by three Electro-Motive 900 hp generator sets. Drive motors are located on rotary, draw works and mud pumps. Barge is shown here under construction at Burton's in Port Arthur. It can drill in water depths up to 30 feet.



Permanent platform rig was put into service in March. It is presently drilling in the East Cameron area in twenty feet of water. Unit has two Electro-Motive 875 hp generator sets with drive motors on rotary, draw works and mud pumps.

NEW COMPANY LAUNCHES TWO RIGS IN ONE YEAR

Gulf Marine uses Electro-Motive Power on both—likes the advantage of "one responsibility"

Gulf Marine Drilling Company of Morgan City, La., is celebrating its second year of business with two new rigs. One, a platform, was put into service in March. The other, a submersible barge, was launched in September.

In discussing why they picked Electro-Motive Power, Gulf Marine placed top importance on these three things: number of rigs using Electro-Motive Power, parts and service facilities available and the fact that one company—Electro-Motive—was responsible for and sole manufacturer of the complete power system.

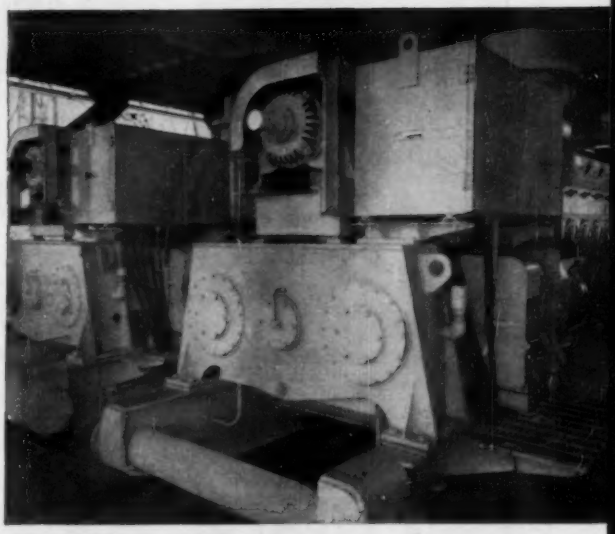
Why is this "one responsibility" important? For one thing, it is assurance that any problems concerning either the engine or electrical components will be handled quickly and satisfactorily—*from one source.*

It means, too, that engine and electrical equipment were designed and manufactured as an integral unit—matched to work better, last longer. It means dealing with only one engineer on installation for the complete power system. And it means one complete facility for all parts and service needs.

Looking at it another way, "one responsibility" is best protection against the extreme cost of downtime. To Gulf Marine with two rigs, the advantages are doubled. Why not ask your Electro-Motive representative about *all* the advantages of Electro-Motive Power?

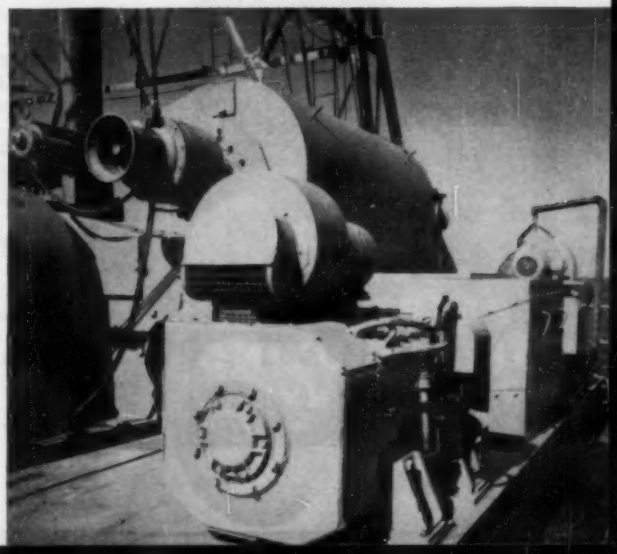
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · La Grange, Ill.

In Canada: General Motors Diesel Limited, London, Ontario
Petroleum industry sales offices: Dallas and Houston, Texas; Morgan City, Louisiana; Los Angeles, California.



Engine sets on the platform are housed in a shed beside the mast. These two are air-cooled. Engine sets on the barge are keel-cooled.

Two drive motors of 675 hp each power the draw works on Gulf Marine's platform. Drive motors and generators on the engine sets are identical except for field windings, a factor that facilitates service and reduces cost.



NOW
IMPROVED
for better-than-ever
THREAD PROTECTION

MEETS TODAY'S
DRILLING DEMANDS!

MONEY
BACK
GUARANTEE

Sold through your favorite supply store

USE JIMMY GRAY
DOPE BRUSHES

PETROLEUM
DISTRIBUTING
COMPANY
BOX 203 - HOUSTON, TEXAS - CApitol 4-9048

Kirby, in the Wilford Oliphant Survey, is about 2 miles northeast of Shamburger Lake field, productive from the Paluxy.

Milam Drilling Co., San Antonio, has a rig working on a contract operation 4 miles northeast of Charlotte, in Atascosa County, Southwest Texas. Operator is C. C. Daughy, whose permit is for a 5,500-ft. test at 1 Stieren.

Continental Drilling Co., New Orleans, is drilling a deep wildcat test for Union Oil Co. of California 2 miles west of Mystic Bayou field, in southern St. Martin Parjsh, South Louisiana. Plans call for a 13,000-ft. test. Location is on Union's Jeanerette lease, in 28-13s-11e.

Louisiana Delta Drilling Co. will drill Southern Natural Gas Co.'s projected 12,000-ft. wildcat test 5½ miles southeast of Belle Isle field in the tidal marshes bordering Atchafalaya Bay, in southeastern St. Mary Parish, Louisiana. Location is on Southern's State Lease 2641.

John Cheatham is keeping a light rig working for Mrs. James R. Dougherty in the Patteson area, Gonzales County, Southwest Texas. Latest contract is for 1-B Patteson, in the Wade Horton Survey. This is a 3,000-ft. test about a mile from production.

Mora Drilling Co. has a new wildcat operation northwest of Southwest Ponca City pool, in Kay County, Oklahoma. It is a 4,000-ft. Mississippian test for Sunray Mid-Continent Oil Co. at 1 State-S, in 36-26n-1e.

Krueger Drilling Co. is under contract to **Anschutz Drilling Co.** for a Tensleep test at a wildcat location north of Kirby field, 15 miles northeast of Thermopolis, in southeastern Hot Springs County, Wyoming. Spot location is in 8-43n-92w. Objective is expected about 4,600 ft.

Shouf Drilling Co. is contractor on another Dakota wildcat test O'Donnell & Edmondson are drilling in the Vavra area, 5 miles northwest of Bushnell, in northwestern Kimball County, southwestern Nebraska. The test is at 1-3 UPRR-Panhandle, in 3-15n-58w.

Carnes W. Weaver Drilling Co., Houston, has a new contract operation in the Holmwood area of southeastern Calcasieu Parish, southwestern Louisiana. It is a 11,000-ft. test for Robert Mosbacker at 1 Farmers, in 27-10s-7w. Location is on the west flank of the field, about 3,000 ft. from nearest production.

INCREASE PRODUCTION

CLEAN OUT
CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less downtime, use world famous Miller Sand Pumps.

Write for descriptive price list.

SAND PUMP SIZES IN STOCK
O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 in.
Lengths, 20, 25, 30 ft.

Composite Catalog Page 3419

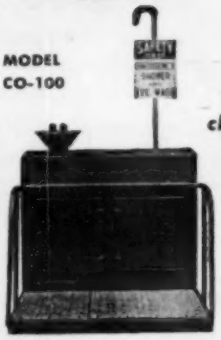
MILLER SAND PUMPS

Miller Sand Pump Co.
General Offices, Box 4516
Oklahoma City 9, Okla.
EXPORT OFFICES
30 Rockefeller Plaza
NEW YORK 20, N. Y.

MORLAND

. . . geared to produce hard-to-find specialties for oil refineries and chemical plants

MODEL CO-100



EMERGENCY SAFETY SHOWER
Combination non-freezing overhead shower and eye bubbler independently activated by aluminum platform treadles.

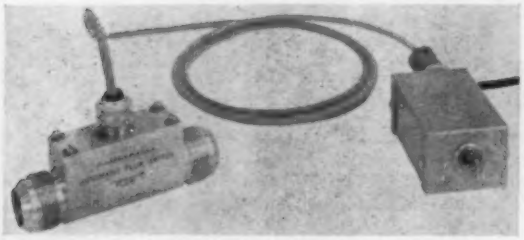
Write for illustrated folder showing other showers, strainers, figure "8's", retractable spray nozzle assemblies, etc.

Above—Spade Flange, Spacer Ring and Figure "8" for raised face flanges. Also made in ring type joint style in all metals and pipe sizes.

Morland Associates
63 South Avenue, Garwood, N. J.
Telephone: SUnset 9-0111 - 2

SHOWCASE...

NEW EQUIPMENT



Small Flowmeter Is Explosionproof

Only 1 in. in size, the flow-sensitive device is compact and designed with in-line flow characteristics. Some will operate at any line pressure.

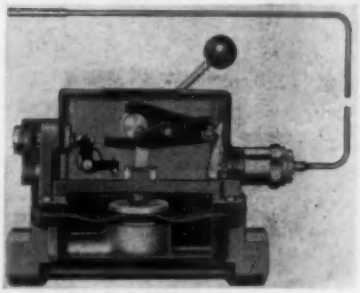
The flow switch is explosionproof, lightweight, and rugged enough to perform under conditions of vibration, shock, and temperature extremes, the maker says. It is capable of detecting reverse flow and will operate in either liquids or gas, completely submerged. Vaporization of volatile liquids occuring during flow will not affect its function. The normal temperature operating range is —85° to 550° F. But a unit can be obtained to function at higher or lower temperatures.

It is available in flanged, screwed, or flared-tube types, made of aluminum, stainless steel, bronze, nickel, Monel, Inconel, and other metals. In process plants the flow switch will detect faulty or partly open valves admitting liquid before or after a process. **Write or call: Potter Aeronautical Corp., Route 22, Union, N. J., for details on Pottermeter flow switch.**

Gas Valve Protects Emulsion Treaters

Known as Model 760, the device is operated by a mercury column. It requires no electrical connections.

Only after its mercury actuated element has become red hot from contact with the pilot flame can the



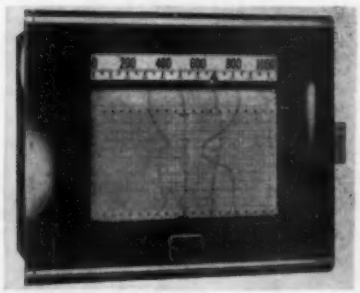
valve be opened. If the pilot fails or goes out, the element cools and releases a latch.

A strong perforated diaphragm guides the disk to its seat. According to the maker, the diaphragm assures positive closure.

The device comes in both ¾ and 1-in. pipe sizes. **Write or call: Partlow Corp., 504 Campion Road, New Hartford, N. Y., for Bulletin 741.**

Telemeter Receiver Prints 16 Records

This multiple-printing strip-chart Metameter telemeter receiver prints out up to 16 separate records from as many telemetering-transmission centers. Using a multiple-switching arrangement, it can monitor successfully a large number of values from



any distance necessary. The variables need not be of one kind. Instead, they may be a combination of pressure, flow, temperature, liquid level, etc.

The instrument prints on a 12¼-in.-wide strip chart. Either a 5-second or 15-second time-impulse telemetering system is available. **Write or call: Bristol Co., Waterbury 20, Conn., for Bulletin M1710.**

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of December 16, 1957

NAME.....TITLE.....

COMPANY.....

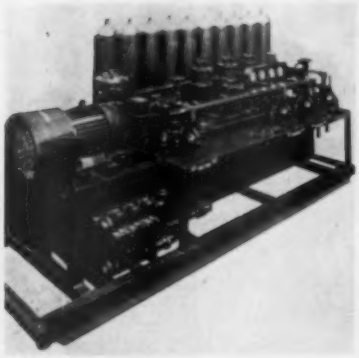
ADDRESS.....

CITY.....STATE.....

DATE.....

SHOWCASE . . .

New Equipment



Closing Unit Built Strong

A combined air and electric system is used in this Koomey Series T-6 closing unit. It will charge a 100-gal. accumulator system to 1,500 psi. in 2.17 minutes and an 80-gal. system to 3,000 psi. in 3.4 minutes, the maker reports.

The stall pressure is 5,000 psi. using 100-psi. air input pressure and 10,000 psi. using 200-psi. Ruggedly constructed, the unit weighs 7,000 lb. It is skid-mounted and features: (1) Ten 10-gal. accumulators mounted in the manifold, (2) multiple pumps, and (3) motors and remote controls. **Write or call: Stewart & Stevenson Distributing Co., Oil-field Div., 1719 Preston Avenue, Houston, for details on Series T-6 closing unit.**

•

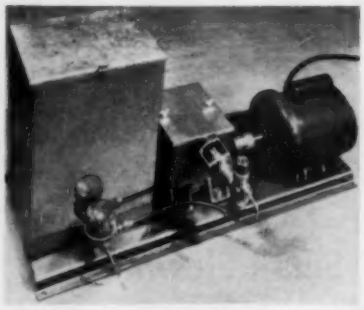
Chemical Pump Injects at 1,200 Psi.

Electric-motor driven, the new Texsteam chemical-injector pump Model SAC-4000 accurately injects measured amounts of liquid chemicals into flow lines and pressure vessels against pressures up to 1,200 psi., the maker reports. It can be used to inject either corrosive or noncorrosive chemicals. When fitted with a check valve, the pump can withdraw measured samples from a flow line.

Either one or two piston-injector assemblies can be mounted on the pump. Thus measured amounts of separate chemicals can be injected at the same time. Output may be accurately preset from a few ounces to 50 gal. per day.

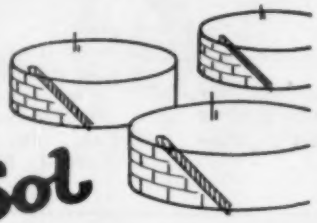
Three piston-injector head assemblies—the ¼-in. piston pumps against 1,200 psi., the ⅜-in. against 500 psi., and the ½-in. against 250 psi. are available.

Each piston has a separate calibrated stroke adjustment which may be locked in position. An explosion-proof motor, air-gas turbine, or light-duty gasoline engine may be used to drive the pump.



The pistons and check-valve assemblies are of stainless steel. The pump head body is Meehanite. Special injector heads may be obtained made of stainless steel, bronze, or plastic to handle corrosive compounds. **Write or call: Texsteam Corp., Dept. 78, 320 Hughes Street, Houston 11, for details on Model SAC-400 chemical-injector pump.**

RECLAIM TANK BOTTOMS with BrakeSol



the most effective chemical for treating

PARAFFIN

The money you make on reclaimed tank bottoms by using BRAKESOL will be substantially more than the cost of treating . . . including chemical and labor. Safe for use in production, pipeline and refinery equipment . . . Contains no chlorides, sulphides or other halides. BRAKESOL Treating Engineers have the experience and know-how to do a successful job. Contact them now!

Treating Engineers Available at These Locations

Ardmore, Okla. 6489
Carmi, Illinois 7191
Casper, Wyo. 3-3433
Dallas, Texas DAvis 4-4884
Ft. Morgan, Colorado Underhill 7-4389
Houston, Texas HOllycrest 3-0448
Kilgore, Texas 3210
Lovington, N. M. 6-3954
New Iberia, Louisiana Ellerbee 9-3498
Odessa, Texas Ellerbee 6-4511
Pampa, Texas MOhawk 9-9994
Edmonton, Alberta, Oklahoma City, Okla. VI 3-6629 WH 9-5561

BrakeSol INC.

P. O. BOX 9506 • OKLAHOMA CITY, OKLA.
EXPORT DISTRIBUTOR THE NATIONAL SUPPLY CO., EXPORT DIVISION

OIL MEN CALL US 'BANKERS'. . . but BANKERS CALL US 'OIL MEN'! ! !

You can talk the strange language of Oil with us because we "made up" some of the words! Fifteen of our directors are directly affiliated with the oil industry. We have one of the largest Oil Credit files in the nation; OIL LOAN service that includes oil-wise Trust Dept. counsel. See R. ELMO THOMPSON, R. OTIS McCLINTOCK, RUSSELL F. HUNT, WM. W. MICHAELS, or BILL KENDALL. Remember, in Tulsa . . . in the Middle West . . . it's BOTH pleasant and profitable to . . .

Think 1st of Tulsa

FIRST NATIONAL BANK & TRUST CO.

SINCE 1895

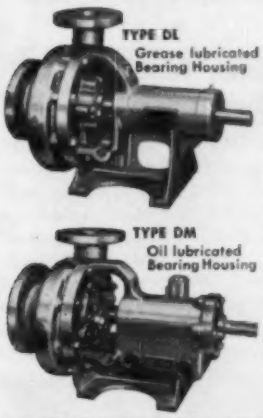
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

NOW—

PEERLESS PUMPS COMBINES QUALITY *with* ECONOMY *in* PROCESS PUMPS

PEERLESS PUMPS

PUT THE IDEA OF PUMP COMPONENT INTERCHANGEABILITY TO WORK FOR YOU FOR SAVINGS IN FIRST COST— IN OPERATION—AND IN MAINTENANCE



Here's how component interchangeability works: Shown at the left are two types of Peerless chemical process pumps. The Type DL has a *grease* lubricated bearing housing; the Type DM has an *oil* lubricated bearing housing. To *either* of these bearing housings, you simply add the required backplate, impeller and volute. You "build up" the pump you want with either a water or air cooled backplate or an open or enclosed impeller.

In this way you match the temperature, pressure and other characteristics of the liquid being pumped. You "tailor make" the pump you want by complete component interchangeability—the Peerless idea—the modern idea in process pump buying.

Result: You stock up to 85% less parts; you reduce your capital investment; you obtain maximum versatility in pump application; you always pump with the most efficient pump for the intended service.

Write for NEW 12 PAGE BULLETIN, which completely describes and illustrates the Type DL-DM pump line, including specifications, dimensional data and performance charts. Use the coupon.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
301 WEST AVENUE 26, LOS ANGELES 31, CALIFORNIA

PEERLESS PUMPS fmc

Factories: Los Angeles 31, California and Indianapolis 8, Indiana
Offices: New York; Atlanta; Chicago; St. Louis; Phoenix; San Francisco; Fresno; Los Angeles; Plainview and Lubbock, Texas; Albuquerque.
Distributors in Principal Cities.
Consult your Telephone Directory.

☐ *Please send me Peerless Pump Bulletin No. B-1608*

NAME_____ COMPANY_____

ADDRESS_____ CITY_____ STATE_____

OGJ

SHOWCASE . . .

New Equipment

Brake Block Hole Area Hardened

The patented "hard-hole" feature in this woven oil-field brake lining offers a solution to the maintenance problem troubling drilling crews for many years, the maker says. It consists of a hardened area immediately around the bolt hole and under the bolt head. This area never comes in contact with the brake drum, but reinforces the area of the block which would normally be crushed if bolts are pulled too tight or which might tear if bolts loosen in service.

The hardened area is obtained by impregnating the back of the brake block for about 3 sq. in. around the bolt holes with a special type of liquid resin. The blocks are then rebaked and the holes recounterbored. **Write or call: Standco Brake Lining Co., 2701 Clinton Drive, Houston 10, for details on hard-hole feature of brake blocks.**

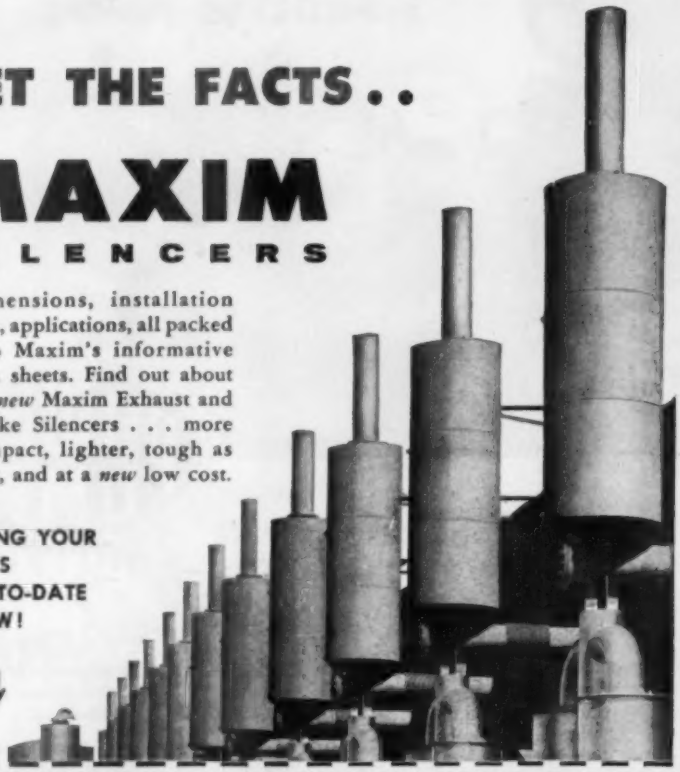
GET THE FACTS . .

MAXIM

SILENCERS

Dimensions, installation data, applications, all packed into Maxim's informative data sheets. Find out about the *new* Maxim Exhaust and Intake Silencers . . . more compact, lighter, tough as ever, and at a *new* low cost.

BRING YOUR FILES UP-TO-DATE NOW!



THE MAXIM SILENCER COMPANY

Subsidiary of Emhart Manufacturing Company

98 Homestead Ave., Hartford, Conn.

Gentlemen: Please send bulletins on silencers for: ☐ WASTE HEAT RECOVERY

☐ INTERNAL COMBUSTION AND STEAM ENGINE EXHAUST AND INTAKE ☐ AIR COMPRESSOR INTAKES AND DISCHARGES ☐ VACUUM PUMP DISCHARGES

☐ BLOWER INTAKES AND DISCHARGES ☐ STEAM, AIR OR GAS DISCHARGES ☐ JET AIRPLANE ENGINE EXHAUST AND INTAKE

NAME _____

COMPANY _____

ADDRESS _____

_____

Tank Built for Field Meter Proving

Working pressures to 2,400 psi. are offered by the new Metrol meter-proving tank for testing the accuracy of positive-displacement meters in field installations. It is built according to the ASME code. A 16-in. flange connection on the bottom neck makes it easy to clean and inspect the interior of the tank.

The vessel can be obtained plastic lined to assure proper drainage of liquids and to prevent deposits of paraffin and other solid foreign matter. Both standard or open, and pressure, or closed, types are available in sizes ranging from 50 to 2,000 U. S. gal. **Write or call: Oil Metering & Processing Equipment Corp., 4843 Yale Street, Houston 18, for details on meter-proving tanks.**

•

Expendable Tubing Gun Made Bigger

The new 2⅛-in.-o.d. Super Mighty Mouse expendable tubing gun is patterned after the 1¾-in. gun. According to the maker, the major advantage of the gun is that debris, after perforating, is broken into small pieces which settle to the bottom and do not form bridges. The gun requires no actuation of charges or switches to fire. Perforations are reportedly free of any carrot or other plugging matter.

The gun is assembled in any desired length. Blank intervals are inserted for perforating multiple zones during one run. The run is reportedly rugged enough to spud through bridges, yet it's flexible enough to pass through bent or kinked tubing. **Write or call: Perforating Guns Atlas Corp., Box 14524, Houston 21, for details on 2⅛-in.-o.d. expendable tubing gun.**

Levingston LOOKS TO THE FUTURE

W. E. PENNINGTON
Executive
Vice President

JIM HERRING
Contracting
Engineer

OTHO HAUNSCHILD
Yard
Superintendent

With increased exploration on the Continental Shelf, the offshore drilling industry is here to stay. Realizing the demand to be put on marine builders and repairmen, far-sighted management at Levingston has made ready for the future. Proven quality in the vessels of today has made Levingston a vital part of the oil industry of tomorrow.

Levingston SHIPBUILDING COMPANY

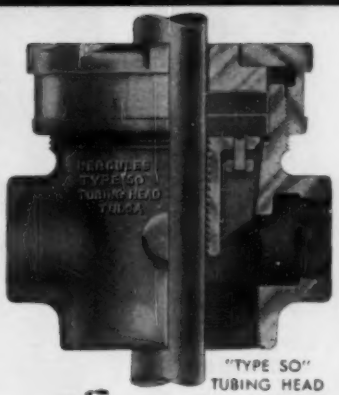
"THE OIL INDUSTRY'S SHIP YARD" • ORANGE, TEXAS

---

there's a Hercules tubing head

TO FIT YOUR REQUIREMENTS...

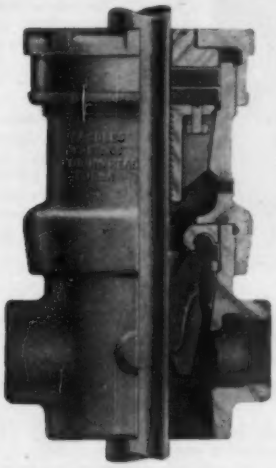
HERCULES "Type SO" Tubing Head is particularly suited for pumping due to compactness (only 12½" high). Stripper rubber can be used in body for running or wiping tubing. Also ideal for intermittently flowing wells.



"TYPE SO" TUBING HEAD

HERCULES "Type SO" and "SOS" Tubing Heads are the favorite of successful operators because of their simplicity, ruggedness and ease of operation. Available in 4½" OD to 7" OD Casing Sizes to suspend 2", 2½" or 3" tubing. Constructed from pressure cast steel and tested to 4,000 PSI. Slips are hinged for ease of installation and positive alignment.

HERCULES "Type SOS" Stripper Tubing Head is unsurpassed for use in well servicing operations as well as on flowing wells. It consists of a HERCULES "Type SO" Tubing Head with a bowl and Neoprene Tubing Stripper.



"TYPE SOS" TUBING HEAD

HERCULES TOOL Company

"MANUFACTURERS OF OIL FIELD EQUIPMENT" SINCE 1924

GENERAL OFFICES AND PLANT TULSA, OKLAHOMA

Available through all supply stores: Export Representative: Oil Field Equipment Co., Inc., 30 Church Street, New York 7, N. Y.

Strahman

HIGH PRESSURE GAUGES

USED IN REFINERIES AND CHEMICAL PLANTS THROUGHOUT THE WORLD

THRU VISION

REFLEX
Single or Multiple Sections

TUBULAR

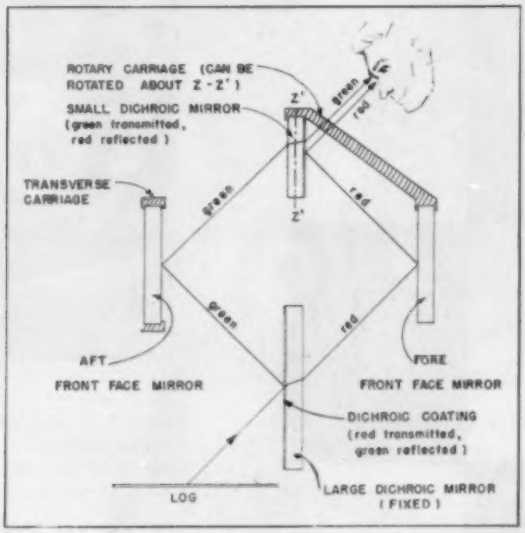
Gauge Cocks
•
Large Chamber Reflex Gauges
•
Heated or Cooled Gauges

SEND FOR COMPLETE CATALOGUE

STRAHMAN VALVES, Inc.
16 Hudson St., New York 13, U.S.A.

SHOWCASE . . .

New Equipment



Comparator Simplifies Dip Calculations

Extra dipmeter log copies are not needed with this new dipmeter comparator. Curve matching is done directly from the original recorded log. The device optically superimposes one curve upon the other in different colors.

When he places a dipmeter log under the comparator, the operator sees two different-colored images of each of the three dipmeter curves. These images can be shifted to match each other by the use of two control knobs—transverse shift and lateral shift.

The lateral shift is calibrated to record directly the depth shift between curves. Thus it provides the necessary data for dip calculations. This optical superimposing of one curve upon the other can be done faster and with better accuracy than by matching prints, the maker says. **Write or call: Schlumberger Well Surveying Corp., P. O. Box 2175, Houston, for details on dipmeter curve comparator.**

•

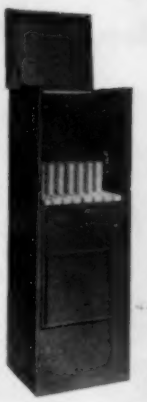
Sucker Rods Made Of Nickel Steel

The National Grade 85 sucker rods are a high-strength low-nickel steel type. They can be used for pumping extremely heavy loads where corrosive conditions are moderate, the maker reports.

The sucker rods come in ⅝, ¾, ⅞, and 1-in. sizes in 25 and 39-ft. lengths. **Write or call: National Supply Co., Two Gateway Center, Pittsburgh, for details on Grade 85 sucker rods.**

KRAFTBILT

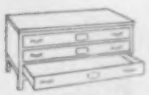
OIL INDUSTRY FILING EQUIPMENT



VERTICAL ROLLFILE V-56

The V-56 is economically built for both field and main office use. Same quality materials as De-luxe Model V-96. The 56 vertical tubes, 2" I.D. protect rolled maps, drawings, tracings, blueprints, 26" to 54", from dust and unnecessary wear. All-steel fire-resistant construction. Complete with indexing system and lock for confidential storage.

Horizontal Rollfile H-342



Strip Log Cabinet G-34, G-36

KRAFTBILT All-Plastic Map sticks and other KRAFTBILT accessories are designed for maximum utility and service.

WRITE for Catalog 57-B on Kraftbilt

ROSS-MARTIN COMPANY
P. O. BOX 800 TULSA 1, OKLAHOMA

SHOWCASE . . .

New Literature

Convection-Type Dryers are described in new eight-page Bulletin D-106. Those dryers are of the solid desiccant type for removing moisture from air and other gases. Construction details are included in the bulletin. Dimensions of the models and utilities required are shown on a special chart. The principles of operation are illustrated through special diagrams in the two-color brochure. **Write or call: C. M. Kemp Manufacturing Co., 405 East Oliver Street, Baltimore 2, for Bulletin D-106.**

●

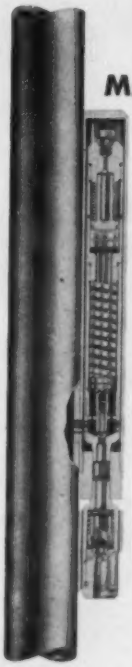
Plastic-Body Stock Valves—said to be more corrosive-resistant than stainless steel—are discussed in new Catalog 420. The plastic body is glass-reinforced with high-impact polyester resin for greater performance as well as increased resistance to corrosion, the maker reports. Results of tests with various chemicals are described in the bulletin. Corrosion-resistant valves, pipe, and fittings for the chemical and petroleum industries are illustrated. **Write or call: W. G. Rovang & Associates, Inc., 1945 North Columbia Boulevard, Portland 17, Ore., for Rovalves Catalog 420.**

●

Polyethylene Ware Catalog 57P contains a listing of apparatus suitable for laboratory work. Polyethylene is a tough, flexible thermoplastic. Odorless, tasteless, nontoxic, chemically inert, and translucent, polyethylene ware is becoming more and more useful in laboratories, according to the maker. Equipment molded from a new type of high-temperature polyethylene that withstands temperatures up to 250° F. is also featured in the 16-page booklet. **Write or call: Schaar & Co., 7300 West Montrose Avenue, Chicago 34, for Catalog 57P.**

●

Increasing Capacity of Scrapers and Extending the Reach of Cranes is reviewed in new Field Report 228. By equipping the scraper with a carrier and using a track cable, machine range is limited only by the spooling capacity of the hoist drums, according to the report. When the boom is supported by a strut or outrigger, a scraper with still greater capacity can be used, as the strut increases overturning resistance. Arrangements of this type have increased rated crane capacity as much as four to one, the



CM2-FS

TIME TESTED MACCO GAS LIFT

MACCO "SPRING" FLUID OPERATED VALVE

("No Charge" Bellows)

In this type valve, with no bellows charge, the spring tension is set as the valve opening pressure. The bellows functions only as a diaphragm, and the spring functions as the total actuating force. When once a valve opening pressure is set by spring tension, the pressure remains unchanged regardless of hydrostatic pressure or temperature applied to the valve in the well. Since the spring in this valve is the total actuating force, the valve may be set with either extremely low or high opening pressure (100-3000 psi). On the "SPRING" fluid operated valve, the spring tension keeps the valve closed until a desired predetermined head of fluid has entered the tubing.

Macco "Spring" Fluid Operated Valves are manufactured in two sizes. The CM2-FS Valve is 1½" diameter for all normal installations. The CM-1FS Valve is 1" diameter and has wide application in dual, macaroni, and slim-hole lifting.

For further information regarding lifting with Macco Fluid Operated Valves, write for Brochure No. 3-12.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas

Phone UN 1-1253

OCECO

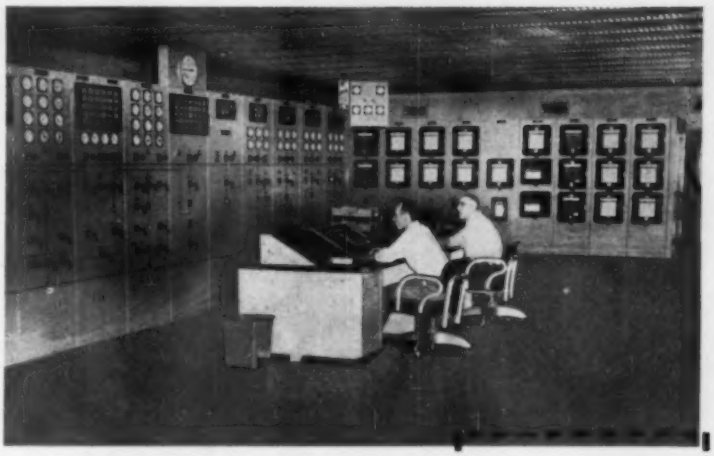
Vapor Conservation, Fire Prevention and Accessory Equipment for Bulk Storage Tanks

Write for Fully Descriptive Catalog

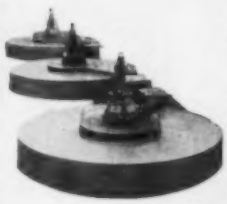
THE JOHNSTON & JENNINGS CO.

4700 WEST DIVISION ST. • CHICAGO 51, ILLINOIS

division of **PETTIBONE MULLIKEN CORPORATION**



100,000 Kw. under control . . . NELSON CONTROL . . . at Gavins Point Dam



This control room, equipped with Nelson instrument panels, control panels and consoles is the nerve center of Gavins Point Dam, South Dakota, which generates 100,000 kilowatts of electricity.

At Nelson Electric Manufacturing Company, engineering know-how and manufacturing skill are combined in producing instrument panels, control panels and graphic panel boards that meet, in every detail, the specifications of each customer.

When quality is important, specify NELSON for the best in electrical control equipment.

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

maker says. The report presents detailed diagrams and photographs illustrating methods of increasing crane capacity. **Write or call: Sauerman Brothers, Inc., 610 South Twenty-Eighth Avenue, Bellwood, Ill., for Field Report 228.**

●

Heavy-Duty Steam-Heating Coils are detailed in new Catalog 1715. The 12-page booklet gives selection data and suggested piping arrangements. Diagrams illustrate the extra-heavy wrought-iron heating coil. Charts list the face areas and net weight, air-resistance temperature-correction factors, "temperature rise" constants, and final temperature and rate of condensation data. **Write or call: Westinghouse Electric Corp., Sturtevant Div., 200 Readville Street, Hyde Park, Boston 36, for Catalog 1715.**

●

Nitralloy Rotary Gear Pumps are comprehensively reviewed in a new 14-page catalog. These pumps are precision manufactured to extreme limits of accuracy, according to the maker. The pumps range in sizes from ¼ to 143 g.p.m. and are built for pressures to 2,000 psi. for lubricating-oil applications. Dimensions in inches are given for all the pump series as well as capacity and horsepower ratings. Pump-performance data and a viscosity-conversion chart are included. **Write or call: Northern Ordnance, Inc., Columbia Heights P. O., Minneapolis, for Nitralloy Pumps catalog.**

●

Demisters—Mist Eliminators and Entrainment Separators are discussed in new four-page Bulletin 21. Included in the bulletin are principles of operation, design considerations, and standard mesh styles. Comprehensive data on engineering, installation, and typical applications are also presented in the two-color bulletin. Performance of the Yorkmesh demisters in vacuum towers, scrubbers, distillation equipment, evaporators, steam drums, gas absorbers, and knockout drums is explained. **Write or call: Otto H. York Co., Inc., 6 Central Avenue, West Orange, N. J., for Bulletin 21.**

●

Cold-Separation Units featuring vertical and horizontal installations are shown in new eight-page Catalog F. The units are packaged, portable, and automatic. They are designed so that the distillate cannot flow out the water outlet. There is also no

Oil Industry's Handiest Tool!

Thompson Vacuum Tanks handle liquids and semi-solids in MINUTES instead of hours!

"It's our handiest tool!" That's what they're saying about the Thompson Unitized Vacuum Tank, and once you've tried it, you'll agree. There's absolutely no substitute when it comes to moving liquids and semi-solids in a hurry.

- *Jobs which once took hours are now on the way in minutes.*
- *Jobs which once called for crews are handled by a single driver-operator.*

Versatile vacuum is a real "go-getter" in all departments: refining, drilling, producing and pipeline. Fast pick-up, transport and discharge make the Unitized Vacuum Tank indispensable to modern cost-conscious operations.

Write today for specifications and the name of those in your area who are operating a Thompson Vacuum Tank. See it in action.

THERE IS A THOMPSON UNITIZED VACUUM TANK FOR YOUR NEEDS. CAPACITIES RANGE FROM 20 TO 100 BBL. COMPLETE UNITS CAN BE SKID, TRUCK, SEMI-TRAILER OR TRAILER MOUNTED.

THOMPSON
TANK and MANUFACTURING CO. Inc.
2019 EAST WARDLOW RD. LONG BEACH 7, CALIFORNIA

Sole Licensee to Manufacture Vacuum Tanks Under U. S. PATENT NO. 2522077.

YEL ⊖ BAK

Industrial THERMOMETERS

Flat Bore—Mercury Filled—Engraved Stem—with 18-8 stainless steel stems. Chromium-plated case to resist corrosion and dirt. These midget industrial thermometers are recommended for equipment requiring Small Armored thermometers . . . and where large industrial thermometers are inappropriate.

An economical instrument . . . because thermometers may be replaced "on the job" . . . that is—refill can be inserted into Armored Case without difficulty . . . eliminates necessity of sending instrument to factory for thermometer replacement. Assured Accuracy.

RS COMPANY

REFINERY SUPPLY COMPANY
621 East Fourth Street · Tulsa 3, Oklahoma
2215 McKinney Avenue · Houston 3, Texas

cenco

CENTRAL SCIENTIFIC COMPANY
1700 Irving Park Road · Chicago 13, Illinois

"mudding off" of the coils and the units eliminate the paraffin problem. The units that have water-removal facilities are constructed so that if the water valve cuts off or fails to open, the compartment will empty. Thus gas will blow but no distillate will flow out the outlet. Specifications of the units are shown in the catalog, as well as a chart showing the water-vapor content of natural gas at saturation. **Write or call: Petroleum Engineering & Tool Co. of Houston, Inc., 2521 Wroxton Road, P. O. Box 6745, Houston 5, for Catalog F.**

•

Fluid-End Parts for slush pumps are presented in new eight-page, illustrated Bulletin 464. Parts include Type G-1 fluid valve and seat, dual seal fluid piston, Blue Stripe and Blue Chrome piston rods and packing, and Nationaloy fluid cylinder liners. Detailed instructions are given on maintenance and installation in the three-color bulletin. **Write or call: National Supply Co., Two Gateway Center, Pittsburgh, for Bulletin 464.**

•

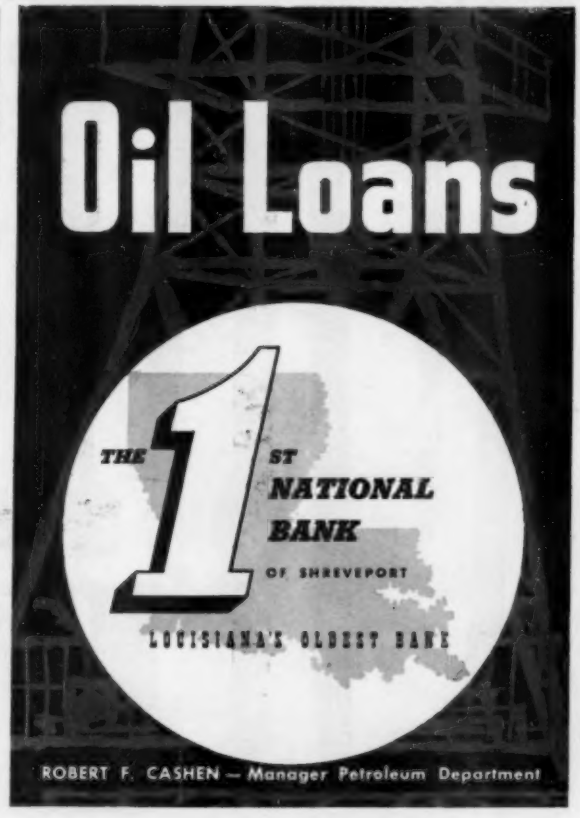
Sheet Packings for Every Industrial Use are described in new eight-page illustrated Bulletin P-328. Detailed specifications, engineering, application, and testing data are presented in the bulletin. The 19 varieties of packing covered are fabricated from such materials as asbestos, synthetic rubber, neoprene, silicone, fiber, and Teflon. All can be supplied in die-cut gasket form in any shape or size, standard or special. Application data that detail the packings recommended for various temperature and pressure conditions are included. **Write or call: Crane Packing Co., 6400 Oakton Street, Morton Grove, Ill., for Bulletin P-328.**

•

Flame-Retardent Polyethylene Sheaths for high-voltage power cables commonly used in refineries and chemical plants are described in new four-page Bulletin RCD-700. The bulletin —punched for notebook insertion— describes the advantages of the new sheating compound, its specifications, and applications. Rating, scope of use, conductor construction, insulations, and shielding of available sheated cables are detailed. Tables show the insulation and sheath thicknesses for 5,001 to 9,000 volts (single conductor, grounded neutral), 9,001 to 15,000 volts (single conductor, grounded neutral), 3001 to 5,000 volts (single conductor, grounded or ungrounded), 5,000 to 9,000 volts (single conductor, ungrounded neutral), and 15,000 volts (single conductor, ungrounded neutral). **Write or call: Rome Cable Corp., Rome, N. Y., for Bulletin RCD 700, "Rozone and Rozone A Insulated Shielded High-Voltage Power Cables Sheathed with Thermoplastic Roseal."**

SOUTHLAND BATTERIES
are delivered direct to your store by our factory trucks
Colonel Southland
SOUTHLAND BATTERY CO.
2040 Amelia • Dallas 35, Texas
Telephone, LAkeside 1-5108

silencers and
spark arrestors
for every industrial, mobile and marine application
Kittell
send for new catalog
KITTELL MUFFLER AND ENGINEERING, INC.
915 SOUTH SANTA FE AVENUE • LOS ANGELES 21, CALIFORNIA



With Magcobar on your well ..

you get dependable service from more than 475 dealer stock points

Dependable service means that you get the materials you want at your well when you want them. It means that your Magcobar dealer has everything in his warehouse to meet any mud problems that may arise. Magcobar's own strategically located warehouses back up the dealers in case of unusual or abnormal demand.

So much can depend on a sound mud program, and so much then depends on your having the right materials delivered on time. Because your Magcobar dealer realizes his heavy responsibility—that you can lose a well if he isn't on the job—he is ready to serve you 24 hours a day. Many Magcobar dealers use radio-equipped trucks to speed drilling mud chemicals to you in the shortest possible time.

Your Magcobar dealer is a local business man with a stake in the prosperity of his area and of his business. That's why he has a stake in your well. That's why he is prepared to give you his best.

Magnet Cove Barium Corporation
Houston, Texas

Magcobar
Complete
DRILLING MUD SERVICE

58—100

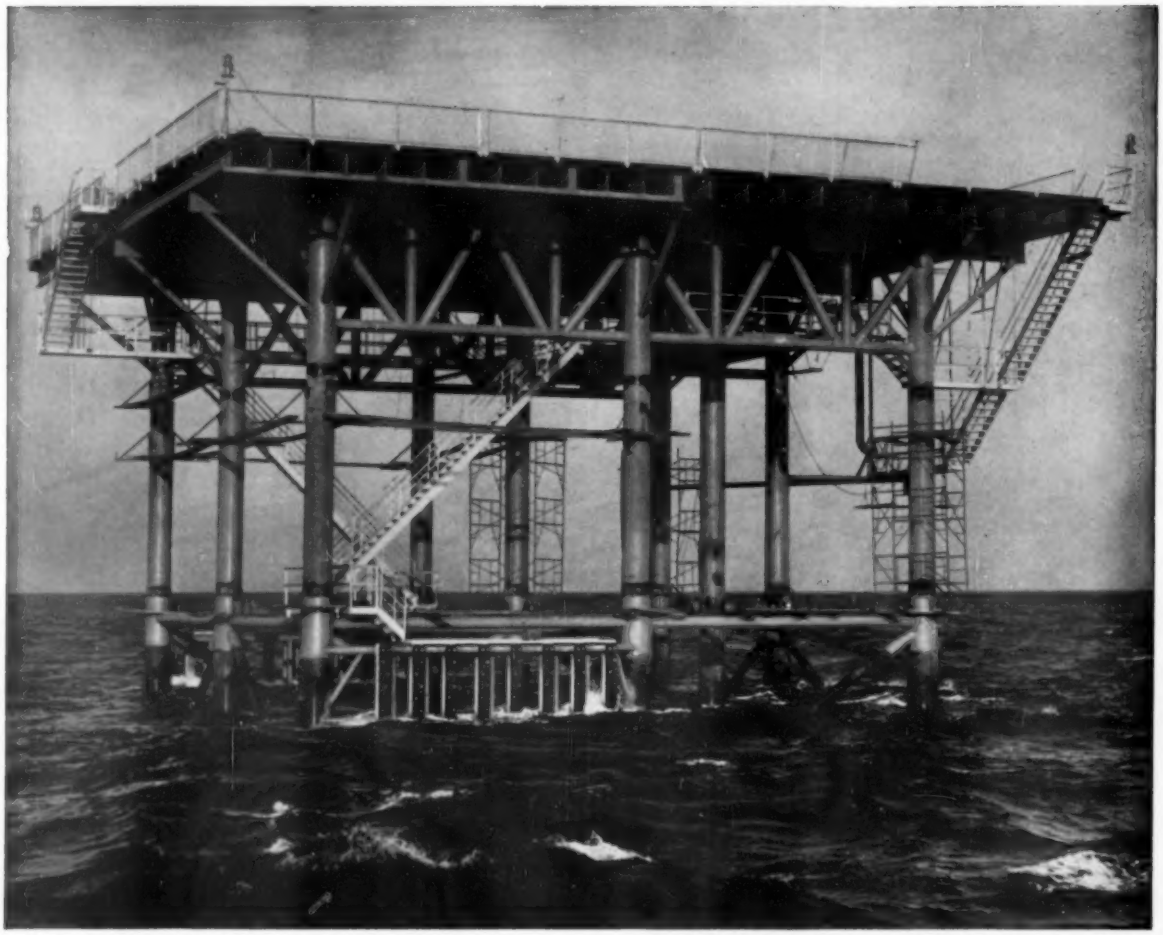


Photo: courtesy Brown & Root Inc.

Coatings based on BAKELITE Vinyl Resins for this off-shore platform of a major oil company were supplied by **Plastic Coating Corporation, Houston, Texas.**

Vinyl resin coatings prove superior for

painting off-shore structures

As one coating manufacturer reports, "After extensive testing, at least 75% of the oil companies operating offshore drilling platforms are beginning to standardize on vinyl-based coatings. It is estimated that these platforms will be in the water about 50 years, so the protection of the steel is of paramount importance."

Coatings based on BAKELITE Brand Vinyl Resins have a long record of excellent performance under severe service conditions. Whether for use on metal, wood or masonry, they resist moisture, salt water and air, corrosive atmospheres, acids, alkalies, and rough usage. For names of suppliers, and a copy of our booklet, "BAKELITE Resin Coatings for the Petroleum Industry," write Dept. YE-128.

IT PAYS TO SPECIFY COATINGS BASED ON

BAKELITE
BRAND
RESINS FOR COATINGS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

Schlumberger Appoints, Opens Logging Units . .

in Texas and Louisiana. Sales engineeers named are: R. L. Smith, at Corpus Christi, Tex.; C. R. Perry, assigned to Gretna, La.; M. J. Broussard, Louisiana Gulf Coast division at Lafayette, La.; and C. B. Dennis, Houma, La..

Schlumberger Well Surveying Corp. has opened two new logging units at Woodard, Okla., and Freer, Tex., to facilitate service in the vicinity of these two towns.

Two Join Marine Division Of R. G. LeTourneau, Inc.

Sherman H. Barber and Lloyd T. Cotten will headquarter at the company's general offices in Longview, Tex., but will spend a considerable portion of their time at the firm's marine construction facilities near Vicksburg, Miss.

S. H. BARBER

L. T. COTTEN

Vice President R. L. LeTourneau said the two appointments were necessitated by expanding activity in the company's construction of mobile offshore platforms.

Barber, naval architect with 23 years in the industry, joined LeTourneau from Halliburton Oil Well Cementing Co. He previously was with Marine Products & Engineering Co. and the electric boat division of General Dynamics Corp. Cotten, marine engineer with 17 years in the industry, joined LeTourneau from DeLaureal & Moses, consulting engineers. He previously had been with Ingalls Shipbuilding Corp. and the naval architectural firm of George G. Sharp.

Oil Company Personnel Attend API-Sponsored School . .

at Kilgore, Tex. Thirty-one representatives from Peru, Colombia, Venezuela, Trinidad, Canada and U. S. came to learn the latest production techniques incorporated in the School of Production Technology sponsored by the American Petroleum Institute in cooperation with the University of Texas Extension Service. During a field trip to Houston, the group toured facilities of Oil Center Tool Co., Magcobar, Brown Oil Tools, Inc., Weatherford Oil Tool Co., Inc., and Schlumberger Well Surveying Corp.

Pictured here, but not in order, are Juan Aquerrevere, Creole Petroleum Corp.; Dale Thomas Caddy, Ohio Oil Co.; Eugene Hugo Delmas, Sinclair Oil & Refining Co.; Louis Rene DeVerteuil, Apen (T'dad) Oilfields, Ltd.; Joseph Everett Flacy, Shell Oil Co.; E. D. Forrester, Magnolia Petroleum Co.; Philip Windsor Frick, Atlantic Refining Co.; Edwin James Hesketh, Caracas Petroleum S.A.; Alfred B. Long, Sun Oil Co.; Marion Lovelace, Magnolia.

Merrit L. McCurry, Weatherford; Sidney Ray McHaney, Mene Grande Oil Co.; Charlie Harvey McHugh, Great Western Drilling Co.; Luis Francisco Mendoza, International Petroleum (Colombia) Ltd.; Benito Hipolito Salas, International Petroleum, Charles Delbert Smith, The Texas Co.; Robert W. Stewart, Ohio Oil Co.; Edward Joseph Wictor and Glenn J. Wilson of Creole Petroleum; Kenneth Eugene Wind, Weatherford; Hubart B. Zaremba, International Petroleum Co., Ltd.

Edward Richard Pizzati, Cal-Tex Co.; James Conway, University of Texas; John F. Gibbs and T. C. Williams of Honolulu Oil; W. E. Creech, B. E. Raywinkle and B. L. Smith, Atlantic Refining; John Van Graham, Great Western Drilling Co.; Raymond William Griep, Shell Oil Corp.; Robert Neill Walker, Tennessee Gas Transmission Co.

National Supply Co. Promotes C. C. Brush . .

C. C. BRUSH

to chief field engineer of the Spang-Chalfant division, s u cceeding Howard G. Texter, who has retired.

Brush started at Spang - Chalfant's plant at Ambridge, Pa., in 1925 and was made a field representative in Houston in 1933. He was transferred to the field engineering department in 1950 and has served as assistant chief field engineer since April 1957.

He will headquarter in the Dallas Federal Building, Dallas, Tex.

J. P. Ratigan, Inc., Moves to New Plant . .

in the Monterey Park industrial tract in Los Angeles. James P. Ratigan, founder and president of the company, states that in addition to larger manufacturing facilities and offices, the new plant will also have increased warehouse capacity where adequate stocks will be maintained for immediate shipment to oil-producing areas throughout the world. Ratigan founded his company in 1917 after working several years in the field.

Oil Well Supply Division Names Representatives . .

in its eastern and Gulf Coast areas. Ray D. Morrison, field representative at Charleston, W. Va., has been promoted to district representative at that city, according to C. H. Maynard, manager of Oilwell's eastern area.

Joseph L. Cashion has been ap-

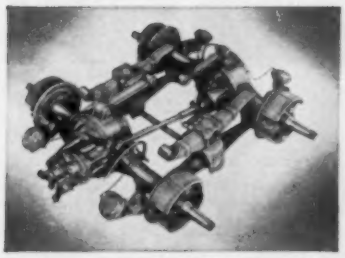
INTERNATIONAL six-wheelers cover the range from 22,000 lbs. GVW to 76,000 lbs. GCW in conventional and COE design. There is one practically custom-built for every hauling job in the world's most complete truck line. Widest choice of load-moving and load-carrying components to keep operating and maintenance cost lowest.

Here's a unique double-duty vehicle – the new INTERNATIONAL Travelette! Seats six big people comfortably in two full-width seats! Hauls up to a full ton load in all-steel 6-ft. pickup body. Service-utility body and four-wheel-drive models available.

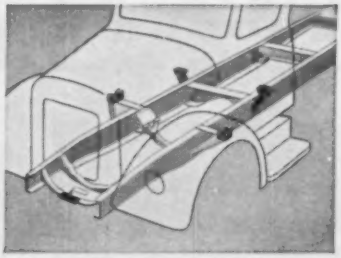
INTERNATIONAL TRUCKS

Longer Tandem Life

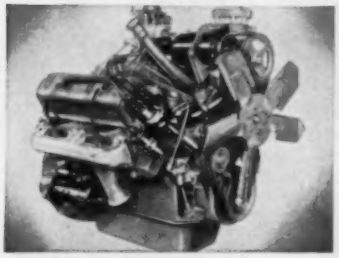
Just one reason why oil men find International Trucks cost least to own!



Plenty of pull on-off-highway with sturdy, long lasting tandems. You get extra flotation, positive traction always.

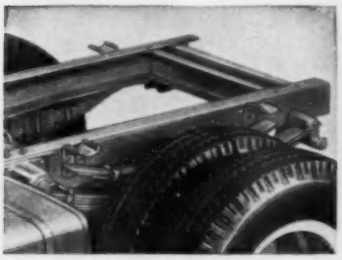


Cabs last longer even in the most severe operations with exclusive 5-point mountings. Quieter, easier riding, too.

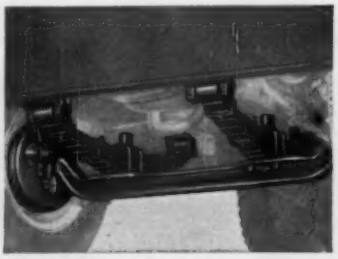


Save time, save money with the most powerful V-8's you can get – to 257 hp. Other power plants up to 356 hp.

Easy to handle even in tightest spots with true geometric steering, cam and roller-mounted steering gears.



Plenty of strength for the toughest jobs and biggest loads with frames that have extra rigidity and proper flexibility.



Maximum load and life with choice of heavy-duty, heat treated high carbon steel axles to meet exact hauling needs.

Tough on-and-off-highway jobs require tandems and all other parts that are built to stand up and take it . . . that will keep operation and maintenance costs 'way down.

And that's the way INTERNATIONALS are built. Cost records prove* this all-important fact – INTERNATIONAL Trucks cost *least* to own.

This superiority doesn't just happen. It's the result of INTERNATIONAL'S rigid policy to build trucks that will do the job better, do it longer and at least cost.

Why not follow the lead of men who know truck costs to the penny – men who have made INTERNATIONAL six-wheelers the sales leader for the past 22 straight years. Make your next truck an INTERNATIONAL.

**Signed statements in our files, from fleet operators throughout the U.S., back up this statement.*

cost least to own!

INTERNATIONAL HARVESTER COMPANY, CHICAGO

Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

pointed field representative at Corpus Christi, Tex., according to M. F. Jones, Gulf Coast area manager.

Morrison joined the division in 1941 at the Charleston store and was appointed field representative at that location in 1950. Cashion was employed by Oilwell in April 1957 at Corpus Christi.

Mission Engineers Speak At Recent Meetings . .

in Midland, Tex., and Lake Charles, La. Sam L. Collier, research engineer for Mission Manufacturing Co., addressed an American Petroleum Institute district meeting in Midland on the subject of "Technical Experiments on Oil Field Mud Pumps." Program chairman for this meeting was M. M. Brantly, Brantly Drilling Co.

"Centrifugal Pumps — Design and Use" was the topic of a talk by Neal B. Heaps, centrifugal pump coordinating engineer, at a meeting of the Lake Charles section of the Louisiana Engineering Society. Program chairman for the section was J. P. Tucker.

For superior protection of underground structures

DURIRON® ANODES

This actual installation shows Duriron's economy and ease of installation.

Twenty Duriron Anodes were installed to protect a pipe line in a creek bed area where sandy soil prevented backfilling. These anodes were jetted into place in the vertical position using a high velocity stream of water, and were placed with the top of the anodes 3 feet below the surface. Each was in position within 60 seconds.

The group of anodes produced an average of 33 amps at 36 volts with no tendency to gas block. Actually, the bed resistance has been decreasing since the original installation. Elimination of carbonaceous backfill saved considerable cost.

- Duriron anodes can be installed bare or with backfill with no current density limitation.
- Duriron is applicable in all soils.
- Duriron has dense homogeneous structure and high weight factor for longer life per anode size.
- Duriron has good electrical conductivity.
- Duriron is mechanically strong. Metal-to-metal contact avoids loss due to poor connection.

Write for Bulletin DA/2
THE DURIRON COMPANY, INC.
DAYTON, OHIO
DURCO

Export Men Train at Web Wilson Factory . .

and general offices at Los Angeles. The recent visitors were Oscar Bernardes of Equipan, Equipamentos Gerais, Ltda., Rio de Janeiro, Brazil, and Klaus Wolf of Fagro GmbH fur Erdol und Bergbau, Hannover, Western Germany.

O. BERNARDES

KLAUS WOLF

These men received factory training courses in the manufacture and operation of Web Wilson Oil Tools, Inc.'s products to enable them to give better service to operators in their respective areas.

McCullough Co. Transfers Newashe . .

to the Rock Springs - Big Piney area in Wyoming, according to I. J. McCullough, president. Branch Manager William Newashe, Jr., will headquarter at the Big Piney service branch, one of McCullough's most recently established service branches. He was formerly at the Kimball, Neb., service branch.

WM. NEWASHE

Newashe, who joined McCullough in 1949 and is experienced in wire line services and fishing tools, will be in charge of operations at both the Rock Springs and Big Piney service branches.

Continental-Emsco Co. Makes Personnel Changes

A. L. Beavers, former production machinery specialist in the Houston office, was promoted to district production machinery specialist. Ray Atchley is the newly appointed drilling equipment specialist for the Wichita, Kans., district office. Ben L. Grace has been appointed district tubular representative for the Corpus Christi district office.

Nelson Names J. L. Gates Agency Sales Manager . .

J. L. GATES

to coordinate sales for 50 factory representatives throughout the U. S., Puerto Rico and Canada. He replaces Paul G. See who has joined Randolph Engineering Corp., Nelson Electric Manufacturing Co.'s sales agency in Los Angeles.

For the past 3 years Gates has been Tulsa district manager of the industrial controls division of Manning, Maxwell & Moore, Inc. Prior to that he served 4 years as chief instrument engineer for The Girdler Co., 16 years in the refinery division of Standard Oil Co. of New Jersey and 4 years as Chicago branch manager for the pump division of Byron Jackson Co.

Three New Vice Presidents Elected by BS&B . .

F. C. MYERS

to oil field sales, engineering and purchasing posts.

Floyd C. Myers has been elected vice president and manager of oil-field sales, according to Kenneth W. Lineberry, president of Black, Sivalls & Bryson, Inc., Lawton L. Laurence has been elected engineering vice president and will serve in a staff capacity. William F. Gates was elected purchasing vice president to serve in a staff capacity.

L. L. LAURENCE

WM. F. GATES

Myers, a BS&B'er for 28 years, has a long and varied record of service in the oil field as office clerk, salesman, branch manager, assistant credit manager, credit manager, district manager and manager of branch operations. In 1954 he was named manager of oil field sales and service.

Laurence, who joined BS&B in 1941, has served as a development engineer, as chief engineer of the oil field equipment division and as sales manager of that division. In 1954 he was named manager of engineering, oil field division. Laurence is the author of many technical articles on oil field production and natural-gas processing equipment and is well known for contributions in the fields of gas dehydration and low temperature separation of oil and gas condensate.

Gates joined BS&B in Oklahoma City in 1926 as purchasing agent. In 1932 he was placed in charge of the company-wide purchasing operation, and in 1946 moved to the company's general offices in Kansas City. In 1950 he was named director of purchases.

Axelson Manufacturing Co. Adds Jack L. Thompson . .

to its hydraulic sales department. According to K. S. Ramey, sales manager, Thompson will serve as sales representative in the Permian basin and Louisiana, representing the complete Hydrax line of Axelson hydraulic pumping units.

Thompson has had over 10 years' experience in oil-field production, both in surface and subsurface equipment. Prior to joining Axelson, he was district specialist in the production division of Emsco Manufacturing Co.

Pipe Cutting or Beveling without an H & M

The simplicity of operation, and rugged, but lightweight construction of H & M Pipe Cutting and Beveling Machines, account for the speed and accuracy that is quickly attained, even by inexperienced operators.

The H & M line of machines and attachments is complete in every detail. 7 models of H & M machines are specifically designed to fit a range of pipe from 1½" to 36".

H & M attachments include the Shape Cutter, which gives precise and accurate cuts, using a proven pattern or templet — The NEW Out-of-Round, featuring greater accuracy in pipe cutting where the circumference of the pipe is of imperfect shape — The Motorized Unit, allowing all models to be furnished with a motor for fully automatic operation — the Flexible Shaft, which allows the operator to stand *in front* of the pipe being beveled, and observe the cut through the full 360 degrees.

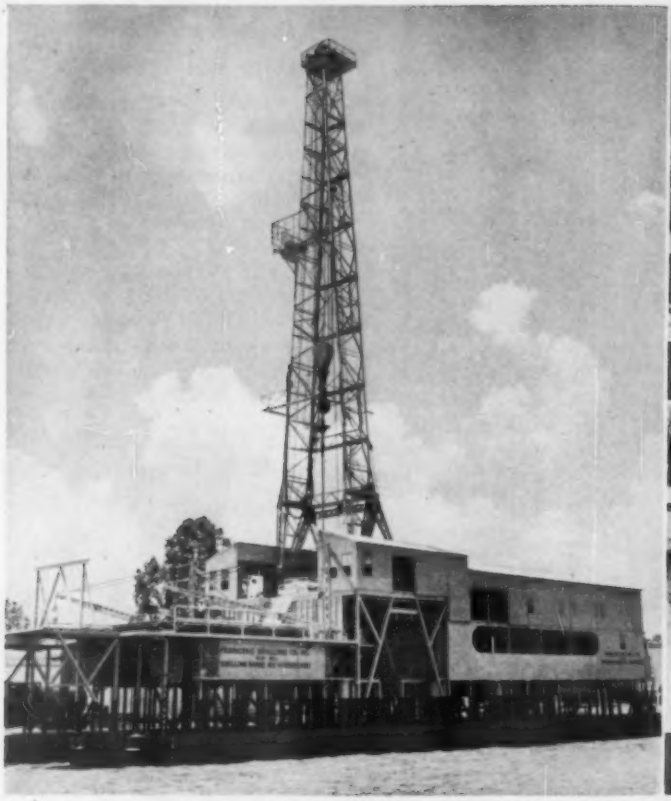
For the full story on the complete line, write H & M . . . today!

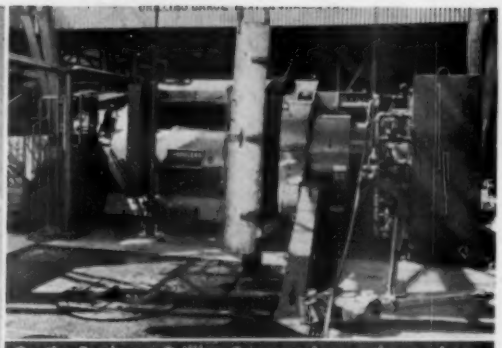
H&M PIPE BEVELING MACHINE CO.

311 E. Third St. DI 3-0241

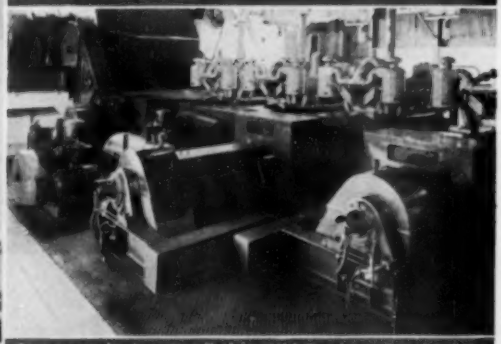
Tulsa, Oklahoma

TM Reg.





On the Producers Drilling Company barge, shown above, is the U-1220 Unit Rig Drawworks and the new 5-27½-A Unit Rig Rotary Table.



Among equipment supplied by Mid-Continent for the Producers Drilling Company barge is the LS-1420 Unit Rig Compound, shown above.

ON THE DRILLING BARGE W. F. YOUNGBLOOD

Another U-1220 UNIT RIG DRAWWORKS FOR HEAVY CONTINUOUS SERVICE

Unit Rig has become known for advanced engineering and as a profitable investment in drilling equipment. Unit Rig equipment is designed for heavy continuous service with a minimum of downtime and repair expense. Leading contractors specify Unit Rig. Producers Drilling Company recently contracted with Mid-Continent Supply Company to furnish a turnkey drilling barge for operation on the Louisiana Gulf Coast. Equipped with a U-1220 Unit Rig Drawworks and LS-1420 Unit Rig compound, this rig meets all requirements of present day deep drilling in the 1,200 to 2,000 horsepower range. The U-1220 drawworks, with mechanical or electric power, already drilling many offshore locations, is applicable for barge or platform drilling as well as land locations. For information on all Unit Rig drilling equipment, contact your Mid-Continent representative.

EXCLUSIVE EXPORT DISTRIBUTOR

MID-CONTINENT SUPPLY COMPANY

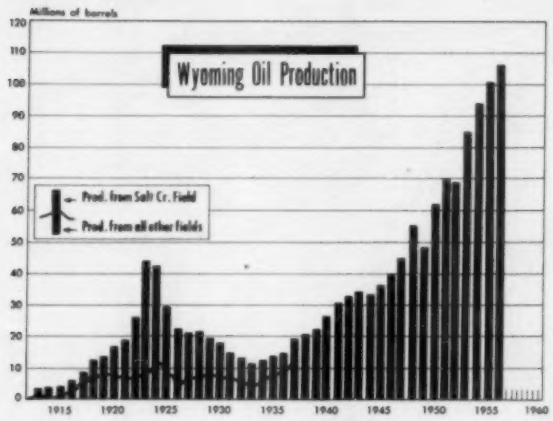
MID-CONTINENT BLDG.
FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y., Cable: MIDCUMPORT NYK

MID-CONTINENT SUPPLY CO.

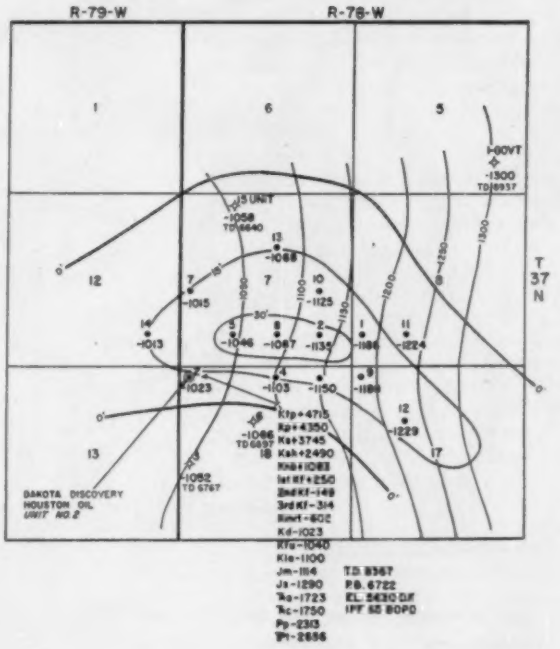
PESA

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



↑ Wyoming's production will continue to climb . . .

. . . as oil finders become strat-trap detectives →



Wyoming Score: 257 Oil Fields

By Frank J. Gardner
Exploration Editor

IT'S BEEN SAID that men who make history haven't time to write about it. But the geological associations of the Rocky Mountain states have refuted this. They've been making exploration history for a decade now, and this year will see the greatest number of new oil and gas fields ever to be found in the Rockies in a single year . . . 168 oil and 48 gas.

In the past 2 years, these Rocky Mountain oil finders have turned out three fine symposia summarizing their achievements. First of these was "The Oil and Gas Fields of Colorado," assembled by the Rocky Mountain Association of Geologists; it was followed by "The Oil and Gas Fields of Nebraska," also by the RMAG. Now, the third, and most ambitious of these books has appeared. It is "Wyoming Oil and Gas Fields Symposium," published by the Wyoming Geological Association, headquartered in Casper.

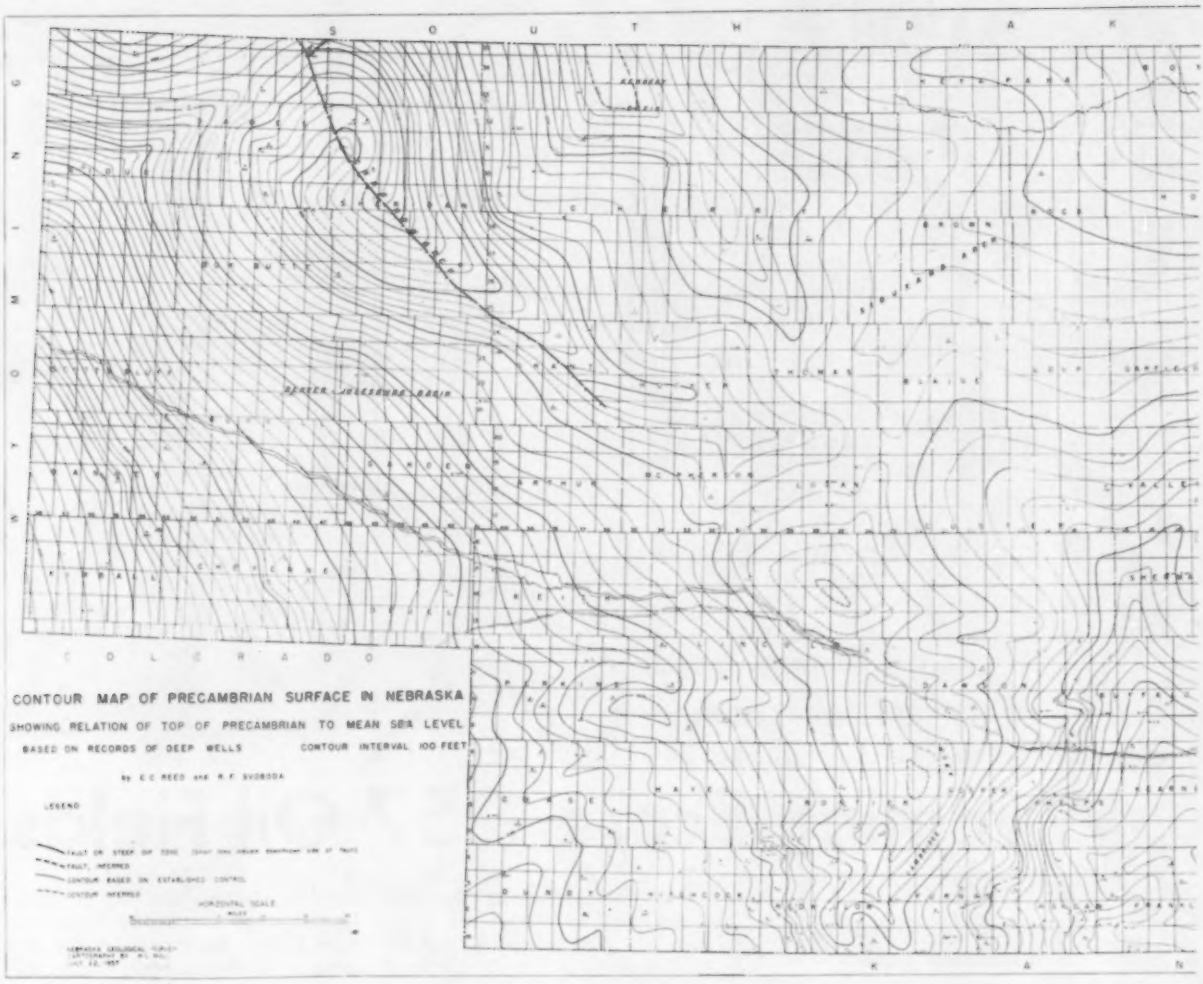
Documented fields . . . This new Wyoming book is the first systematic review of the state's fields in nearly 20 years. Bulletin 418 of the U. S. Bureau of Mines covered the 75 fields discovered prior to 1938; it was a valuable piece of work, but has been out of print for many years. The 257 fields covered in the WGA's new release are evidence of the rapid growth of Wyoming's oil industry since 1938.

The Wyoming geologists-turned-authors have come up with some innovations in this third symposium. For one thing, the volume is bound in a loose-leaf ringed cover, so that new data and personal or confidential information can be added to it; for another, the association intends to keep the book up to date by publishing supplement sheets in the years ahead. A standard format was adopted for portraying each field on a data sheet, and a structure map faces each field data page. A paste-in pocket contains larger field maps and a state map.

And more strat traps . . . In his introduction to the book, M. D. Hubley, president of the WGA, says, "In recent years an increasing proportion of the fields discovered combine other factors in addition to structure as control for the accumulation . . ." In other words, the elusive stratigraphic trap is coming more and more into the exploration picture, and more of them are being found. The map of Burke Ranch field, shown on this page, illustrates Hubley's point; a slight structure combined with vital sand thinning produces a commercial oil trap. This small field, a 1½-million-barrel reserve, is typical of many that are now being uncovered and of many that still lie undiscovered.

The production curve for Wyoming shows at a glance what has happened in the 20 years since the Bureau of Mines issued its Bulletin 418. We cannot say that the publication itself resulted in this steady growth of production, but there's little doubt that the data it contained went into the mixing machine of some oil finder's mind.

Will push production up . . . By studying other geologists' opinions and accomplishments, oil finders of the future will no doubt base many important decisions on data contained in the new WGA symposium. The production curve will go upward just as long as Rocky Mountain geologists continue to make exploration history.


CONTOUR MAP OF PRECAMBRIAN SURFACE IN NEBRASKA
SHOWING RELATION OF TOP OF PRECAMBRIAN TO MEAN SEA LEVEL
BASED ON RECORDS OF DEEP WELLS
CONTOUR INTERVAL 100 FEET
by E.C. REED and R.F. SVOBODA
LEGEND
HORIZONTAL SCALE

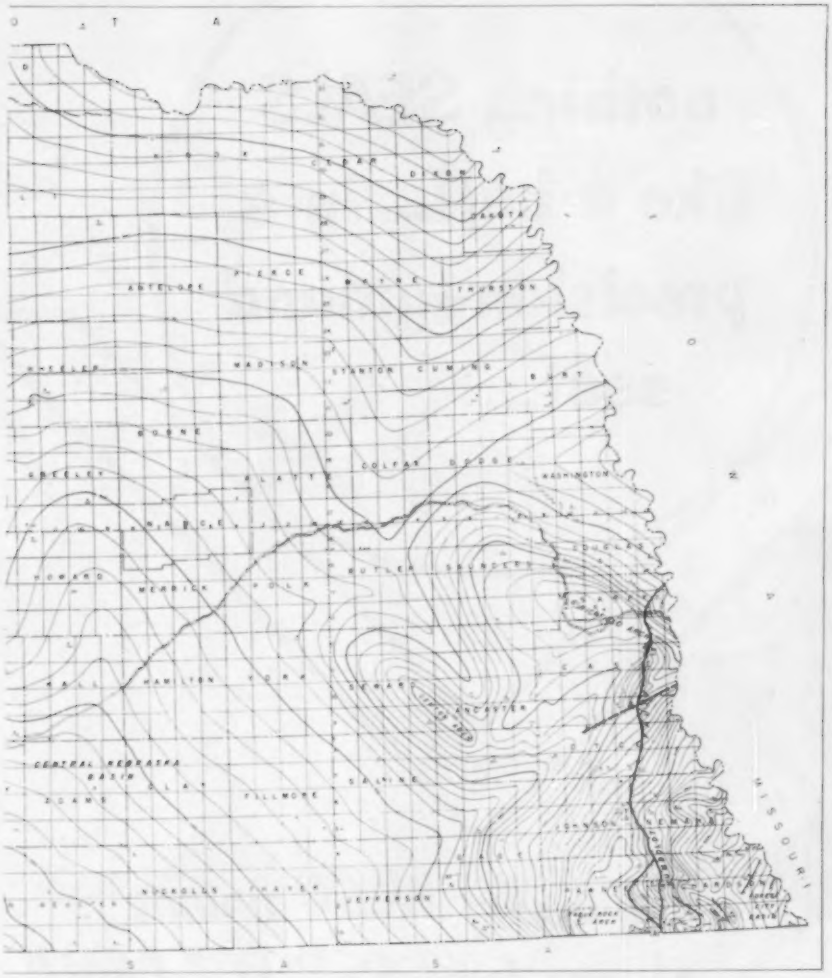
NEBRASKA'S POSITION on the oil-finding scale remains high, pushed on by excellent wildcat and

Nebraska's 1957 Record: 776 Wells,

AFTER NEARLY 8 years, Nebraska remains one of the busiest and most successful of the nation's oil provinces. Although there has been production in the state for many years, the real oil push didn't begin until 1949 at Ohio Oil Co.'s Gurley field discovery well in the Denver basin of southwestern Nebraska. The state's first production was in the far southeast corner of the state in the Forest City basin, but this area never blossomed into an important oil-producing province. The Denver basin play, however, fanned out in all directions following the Gurley discovery, embracing northeastern Colorado, Cheyenne, Kimball, Banner, Deuel, Morrill, and more recently, Scotts Bluff and Dundy counties in southwestern Nebraska.

A 2-year lead . . . For nearly 2 years the western and southwestern counties in Nebraska have led the Denver basin exploratory and development program. Until the last few months northeastern Colorado's contribution to the Denver basin race had dwindled considerably. Western Nebraska's part in the play remains strong. Wildcatting is just a bit higher than it was a year ago, although total well completions are down from last year.

As of November 9 there were 776 wells completed this year compared to 822 at the same date last year. Of this total, 423 wildcats were completed compared to 409 at the comparable 1956 date. There have been 38 new oil fields and one gas field opened in the state this year. One of these new oil finds is in Harlan County in the South Central Nebraska portion of the Central Nebraska or Salina basin. Another oil strike was made in Dundy County in the extreme southwest corner of the state in the eastern reaches of the Denver basin. One new field was opened in Red Willow County on the Cambridge arch, while another important oil strike was made in Scotts Bluff County extending Denver basin production in Nebraska to its northernmost point. The remaining oil fields and the one new gas find were confined to the Denver



development success in the Denver basin portion of the state. Fig. 1.

38 New Oil Fields

basin portion of western Nebraska. Banner County holds the lead in this campaign.

The record . . . Nebraska Geological Survey records show that a total of about 3,200 tests for oil and gas had been drilled and completed in the state to July 1, 1956. This includes 1,102 oil wells, 74 gas wells, and about 2,024 dry holes. This drilling was scattered over 75 of the 93 counties in the state, most of it being in Kimball, Cheyenne, Banner, Morrill, and Richardson counties. All of these are in the Denver basin except Richardson (Forest City basin).

Wildcats have been well scattered over the state . . . Dawes, Deuel, Harlan, Garden, Scotts Bluff, Box Butte, Sioux, Nemaha, Chase, Red Willow, Cherry, Buffalo, Furnas, Sheridan, Gage, Lincoln, Perkins, Keith, Pawnee, and Hitchcock. The state's records show that to July 1, 1956, there were 143 oil fields and 3 gas fields in the state. (The Oil and Gas Journal records 39 oil discoveries in the state in 1956.)

Since first production in the state in 1939, production to January 1, 1957, amounted to 54,182,000 bbl. of oil and more than 41 billion cubic feet of gas.

Geologic sketch . . . Nebraska has many varied geologic provinces. The southwestern part of the state is in the Denver basin. The extreme northwest corner of the state includes part of the Black Hills uplift of South Dakota. The Chadron arch cuts down across the western part of the state, northwest-southeast, joining up with the larger Cambridge arch which extends on down into Kansas' Central uplift. A small basin in North Central Nebraska is known as the Kennedy basin. Most of the state is taken up by the Salina or Central Nebraska basin, while the extreme southeast corner contains part of the Forest City basin (see Fig. 1).

Pay zones . . . Most Nebraska production comes from rocks of the Dakota group (Upper Cretaceous). The pay zones of Cretaceous age are designated by the letters "D" and "J." The "J" zone is the biggest oil producer in the Denver basin.

Pennsylvanian oil production in Nebraska comes from rocks of Lansing-Kansas City age. Pennsylvanian oil in the state is found on the Cambridge arch. In the Forest City basin Dawson field in Richardson County has Devonian (Hunton) production, and Viola and St. Peter (Wilcox) of Ordovician age.

Biggest field . . . Sloss field in Kimball County, western Nebraska, is the state's biggest oil producer, and the second largest in the entire Denver basin. During May the field's output was more than 9,100 bbl. daily. This field has grown at the weekly rate of about two wells. As of July 19 there were 72 producers in the field.

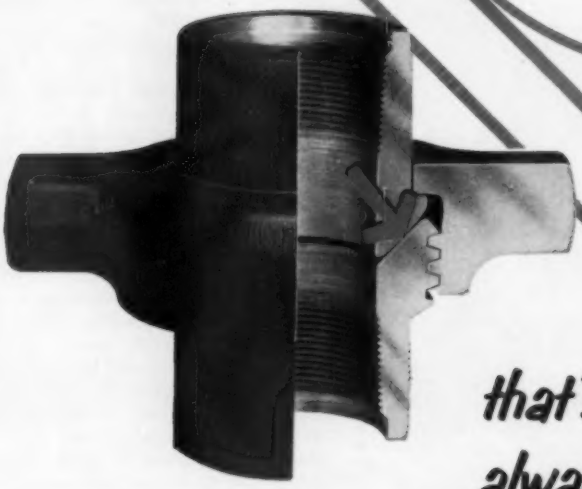
James P. Sloss and Nebraska Drillers opened the field in 1954 at 2 State in C NW NW 36-14n-55w. Initial production on pump was 142 bbl. per day. There was only one dry hole drilled after the discovery well. Completions range from 45 to 400 bbl. per day with the average daily output about 250 bbl. The oil comes from two beaches of "J" sand between 6,200-6,300 ft.

The field's oil is moved out by Service Pipeline. Pan American Petroleum Corp. is the biggest producer in the field and holds most of the leases. At midsummer more than 1,500,000 bbl. of oil had been produced at Sloss.

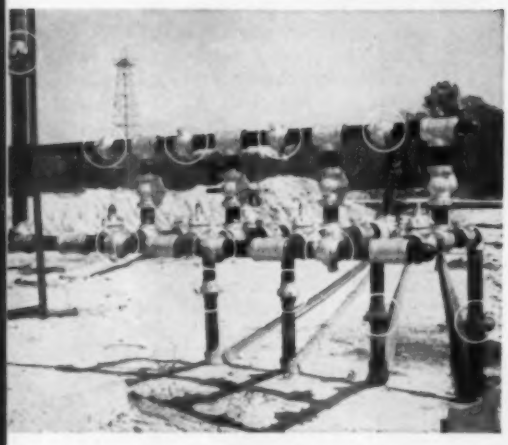
The Sloss success illustrates the fact that the Denver basin portion of Nebraska still holds many surprises and will continue to be one of the busiest of Rocky Mountain provinces in the coming years.

Much left undone . . . The tremendous success of the Denver basin portion of Nebraska in oil discovery has stimulated new exploratory interest in the

nothing SEALS like a ball... in a precision-ground seat...



that's why WECO unions always form PERFECT SEALS



Years of field service on the toughest jobs, with pressures ranging to 15,000 psi, afford positive proof that nothing seals better than the ball and cone design of WECO Unions. The spherical surface of the male sub always forms a perfect seal against the conical surface of the female sub, providing a secure metal-to-metal seal time after time; a seal that refuses to leak under high pressures, shock, surge or vibration.

WECO Unions are durable as well as efficient. They have stronger subs and wing nuts, heavier wall construction, and sturdy Acme threads. These factors all add up to unions that take the toughest treatment as a matter of course—and come back for more—on hook-up after hook-up.

WECO Unions are available in sizes from 1" through 12", pressures from 1,000 through 15,000 psi—at supply stores everywhere.

U-1-57

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

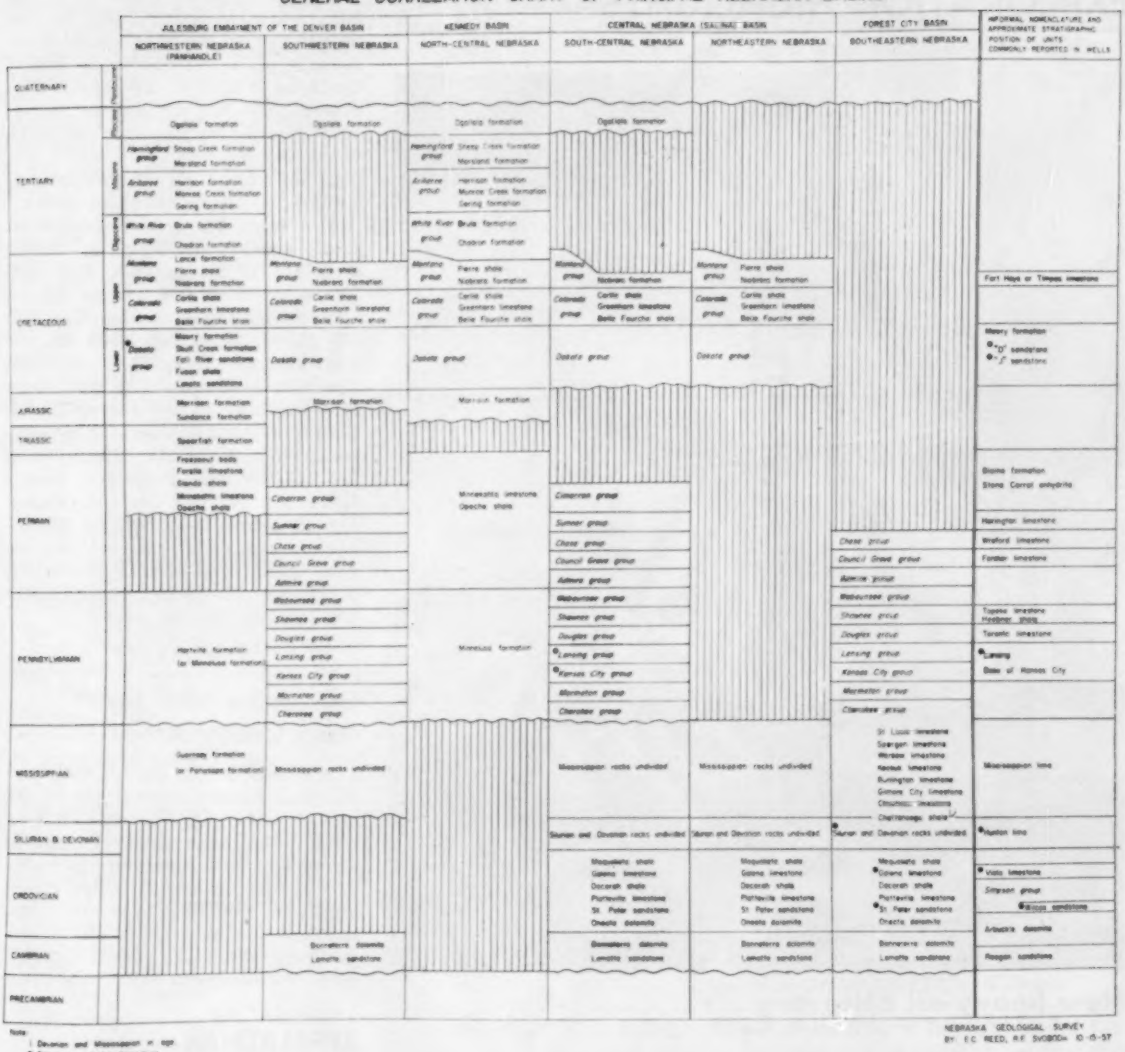


Fig. 2.

vast expanse of sparsely tested areas elsewhere in the state.

... The Chadron arch. Although there has been no production on this northwestern Nebraska arch as yet, it has been one of the busiest wildcat areas in the state for many months. The heat of the drilling here has been in Sioux County and in Dawes County.

... The Cambridge arch. The northwest extension of Kansas' Central uplift has been a bit more successful than the Chadron arch. Two small Pennsylvanian oil fields were opened last year in the Red Willow and Hitchcock County area near the Kansas line. These discoveries were followed by a flurry of drilling on both sides of the state line with most of the success coming in Kansas.

... Central Nebraska basin. This vast area includes the entire center of the state and is the northern extension of the large Salina basin of Kansas. Neither basin has much production and they remain two of the country's possible future petroleum provinces. There is some small production at the southern end of the basin near the Kansas line. In Kansas, Salina basin production is restricted to the extreme southern edge of the basin.

... Forest City basin. This small area in the southeastern corner of Nebraska is another of the nation's small producers but still highly promising. There has been production in the basin for many years but in recent years very little drilling activity has been recorded in either Kansas, Missouri, or Nebraska's portion of the basin.

Since the biggest percentage of Nebraska drilling activity has been in the far southwest and western counties, nearly three-fourths of the state remains sparsely tested. What the state needs is wildcats and lots of them. Success in any of the state's many regional uplifts and basins will set off a much-needed exploratory campaign in every corner of the state.

Note: Some of the statistical matter and all illustrations for this article were taken from "Nebraska Deep Well Records," by E. C. Reed and R. F. Svoboda, recently published by the Nebraska Geological Survey, Bulletin 17, Lincoln. End.

EXPLORATION HIGHLIGHTS

New heavy-oil discovery in Park County, Wyoming, pumped 248 bbl. of black oil in 24 hours on test of perforations in the Phosphoria at 5,068-94 and 5,104-34 ft. The new-field opener is Husky Oil Co. and Cabeen Exploration Corp. 1 Husky-State in C SE SW 2-48n-103w, Big Horn basin. Location is in the Rose Creek area, 6 miles from Pitchfork field and about 50 miles from Husky's Cody refinery.

ROCKY MOUNTAINS

WYOMING

Flow Gaged at Rolff Lake Confirmation Well

The confirmation well to new Rolff Lake field in Fremont County in the northwestern Wind River basin flowed 10 bbl. of oil hourly from the Phosphoria-Permian from perforations at 4,856-4,906 ft.

The operator also tested the Curtis-Triassic sand at 3,504-54 and 3,560-76 ft. The 1-A Tribal, SE SW 26-6n-3w, is the southeast extension to Phillips et al. Rolff Lake, the discovery well of the field which flowed 256 bbl. of oil in 4 hours from Phosphoria and 79 bbl. of oil in 4 hours from the Curtis sand.

UTAH

Development Continues Brisk at Aneth Fields

Shell Oil Co. reports that 4 of 11 recent completions at Ratherford and Aneth fields in San Juan County, Paradox basin, had large oil flows.

Shell 43-16 State-3, C NE SE 16-40s-24e, flowed 2,400 bbl. of oil per day on 1-in. choke from perforations at 5,380-5,495 ft. in the Paradox.

Three Ratherford field wells were completed with big potentials. The 41-13 North Desert Creek in C NE NE 13-41s-23e, made 2,080 bbl. of oil per day on 48/64-in. choke from Paradox. The 33-12 North Desert Creek in SW NW SE 12-41s-23e, flowed 2,088 bbl. per day on 38/64-in. choke from the Paradox. The 31-13 North Desert Creek well flowed 1,550 bbl. per day from perforations at 5,438-5,564 ft. on 48/64-in. choke.

The Texas Co. recently completed seven excellent wells in the Aneth area. The 10 Navajo-D, C NW NW 20-40s-24e, made 936 bbl. per day on 1-in. choke. The 11 Navajo-C, C SE NE 25-40s-24e, flowed 1,340 bbl. per day. The 15 Navajo-C, C NW SE 24-40s-24e, flowed 1,254 bbl. daily on 1-in. choke. The 6 Navajo-G, SE SE SW 17-40s-24e, flowed 1,368 bbl. per day on same choke. The 5 Navajo-L, C NW NE 20-40s-24e, flowed 1,128 bbl. per day on 1-in. choke. The 12 Navajo-D, C NW SE 20-40s-24e, flowed 1,260 bbl. per day on 1-in. choke, and the 11 Navajo-D, C NE NW 22-40s-24e, flowed 1,392 bbl. per day on 1-in. choke.

COLORADO

Gas Strike Seen for Mesa County Area

A wildcat in the Divide Creek area of Mesa County flowed gas at the rate of 4,640 M.c.f. per day on 1-in. choke. The indicated offset strike to a recent workover discovery in 36-8s-91w is Sun Oil Co. 2 Divide Creek Unit, SE SW NE 26-8s-91w. Perforations are at 4,810-32 ft. It lies northwest of Gordon Hurd 1 Government, the discovery well in the area.

APPALACHIAN

OHIO

Edge Tests at Moreland Make Producers

Tests on the extreme north and south ends of Moreland pool proved to be producers. Vanson Producing

EXPLORATION THIS WEEK

Rocky Mountains	168
Appalachian	168
California	169
Canada	171
Illinois Basin	172
Louisiana	175
Michigan	176
Nevada	176
North Dakota	176
Oklahoma	176
Texas	180
Successful Wildcats	182

Co. 1 Erma Miller, Section 22, Franklin Township, Wayne County, logged the Clinton-Silurian at 3,574-3,632 ft. and gaged 79 bbl. of oil and 700 M.c.f. of gas in 24 hours after fracture.

● Preston Oil Co. 1 Raymond Baker, Section 3, with sand at 3,568-3,627 ft., and gaged 440 bbl. after fracture.

Pleasant Township Wildcat Flows Gas in Perry

A wildcat 1½ miles west of production in Pleasant Township, Perry County, gaged 2,740 M.c.f. per day after fracture. Witherspoon and McGee 1 N. D. Murray, Section 24, had a showing of both oil and gas, natural, in the Clinton-Silurian at 3,572-3,637 ft.

Success Recorded at Reading Township Well

In Reading Township, Stewart Oil Co. 1 Frances Noll, Section 28, 1 mile from production and among dry holes, found the Clinton-Silurian at 2,975-3,005 ft. Gage was 1,100 M.c.f. of gas after fracture.

EASTERN KENTUCKY

Pike County Test Drilling Ahead

In Pike County, a United Fuel Gas Co. wildcat, 27 Kentland Coal & Coke Co. is drilling ahead at 3,453 ft. in slate and shells. Test is located on Rockhouse Branch of Peter Creek. Formation tops reported to date include: Mississippian Big lime at 2,505 ft. and Mississippian Maxon sand at 2,280 ft. Elevation is 1,111 ft.

WEST VIRGINIA

Preston County Wildcat Makes Gas Discovery

In Reno district, Preston County, West Virginia, Hope Natural Gas Co. 10096 Florance M. Auvil, wildcat, elevation 2,028 ft., had a final gage of 7,900,000 cu. ft., gas after fracture, chert 4,570 ft., gas 4,619 ft., Oriskany sand 4,722 ft., gas 4,744 ft., Helderberg 4,834 ft., gas 4,927 ft., TD 4,984 ft. The well is now shut in for rock pressure test.

CALIFORNIA

Piru Canyon Discovery

Harold C. Morton and H. S. Kohlbush, operators, completed a shallow discovery well in Piru Canyon, 3 miles northwest of Oak Canyon field in Los Angeles, making 30 bbl. net daily on the pump. Gross production on completion was 134 bbl. daily with the crude gravity running around 29.5°. The well is producing from a total of 92 ft. of zone within 10 intervals between 365-900 ft.

Roberts Island Extended

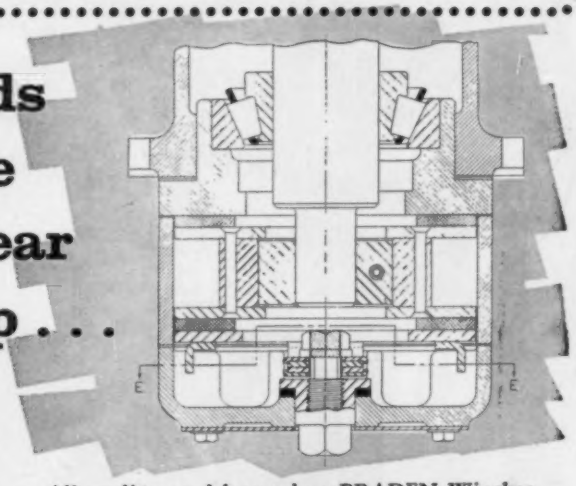
Standard Oil Co. of California, Western Operations, Inc., extended production in Roberts Island gas field of San Joaquin County about a half mile southeast of production with a 5,350-ft. test in NW SW 25-1n-5e. It was completed in the MacDonald Island sand at 5,251-68 ft., making 2,275 M.c.f. daily through a ¼-in. choke.

Cal-Standard Busy at Buena Vista Extension

Standard Oil Co. of California was drilling ahead below 2,630 ft. on an extension test located about ½ mile east of Tidewater Oil Co.'s new Stevens sand discovery in Buena Vista Hills field, Kern County. In addition,

BRADEN TRUCK WINCHES

Holds Like a Bear Trap . . .



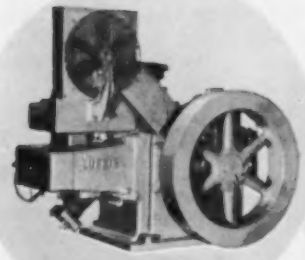
All medium and heavy-duty BRADEN Winches are equipped with the famous BRADEN Oil-Cooled, Fully-Adjustable, Automatic Safety Brake. This brake, which was developed by BRADEN engineers, gives positive action under all conditions, and enables the operator to always keep the load under perfect control.

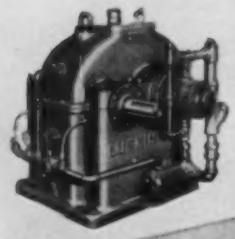
BRADEN WINCHES are made for back-of-cab and front mounting and range in capacities from 6,000 to 100,000 pounds. Specify BRADEN Winches . . . and be sure!

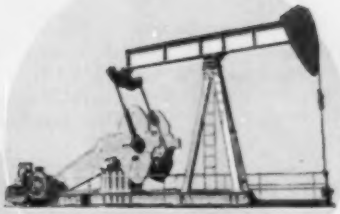
WRITE FOR CATALOG

BRADEN WINCH COMPANY
P. O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches
In service around the world



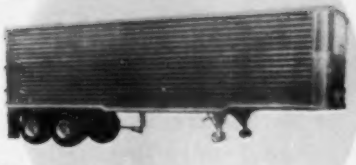




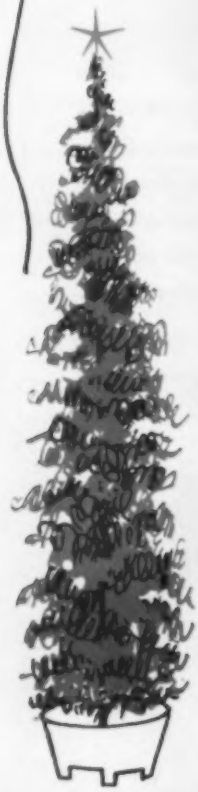
THE 1500 EMPLOYEES OF THE
OIL FIELD, TRUCK TRAILER, AND
MILL SUPPLIES DIVISIONS OF

LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS



Wish all of their Friends a Very Merry Christmas and a Happy, Healthy, and Prosperous New Year



Tidewater was clearing a location for a northeast offset to the find.

Tidewater's discovery was completed early last month in a Stevens sand pool at 5,089-5,199 ft. making 400 bbl. daily of 31.2°-gravity crude through a 12/64-in. choke. The location is on the extreme north edge of the big field.

Production Extended at San Joaquin Field

Standard Oil Co. of California extended production ½ mile southeast of the main area of the Roberts Island gas field in San Joaquin with a successful completion in NW SW 25-1n-5e. The well was brought in making 2,275 M.c.f. daily through a ¼-in. choke from perforations at 5,251-5,266 ft.

Union Stakes First City of Bakersfield Test

Union Oil Co. of California expects to spud in its first test for Stevens zone production within the city limits of Bakersfield by the end of the month. The drill site will be in the southwest part of the city in NW NE 6-30s-28e.

Union last year signed up more than 5,000 town lot leases in the west and southwest part of the city in this play. The company will use a completely soundproofed rig for the drilling. The wildcat, 1 Mon, has a programed depth of 7,000 ft.

Signal Gets Good Well From Redondo Tidelands

Signal Oil & Gas Co. completed 8 City of Redondo Beach from its recently constructed earth-filled drill site on the ocean front making 264 bbl. daily of 18.7°-gravity crude, 1 per cent cut. Signal now has two rigs drilling slant tests under the Pacific Ocean from this site. Prior to building the earth-filled structure, the company completed six slant drilled wells from a highly compact drill site onshore.

Half Moon Bay Test Slated

M. J. & O., Inc., will drill a wildcat, 1 Mateo-Pacheco, about a half mile north of abandoned production in the Half Moon Bay area of San Mateo County on the coast. This area dates back to 1867 when the first attempt was made to obtain commercial production from the Pliocene and Miocene formations. It wasn't until 1886 that commercial production was brought in. This area is the state's most northerly sedimentary basin to produce commercial quantities of high gravity oil and gas. It is located about 30 miles south of San Francisco.

Northwest Offset Staked At New Kerr Pool

Superior Oil Co. has staked a northwest offset location to its recent new pool discovery about ¾ mile south of the Paloma field in Kern County. This also was a Stevens sand find.

CANADA

ALBERTA

Second Well at Waterton Park Comes In

The Foothills Belt running along the Rocky Mountain front of southwestern Alberta which now boasts such gas areas as Pincher Creek, Savanna Creek, Turner Valley, and Jumping Pound, now has another productive region which is fast developing into one of the most prolific. More incentive was added for developing this region during the last week when wet-gas was discovered at another hole

Exclusively
SPANG
The ONLY...and we do mean ONLY completely weldless alloy-steel
jars
in service in the drilling industry
One piece—no welds to break. Drills up to four times more footage with less time and costs spent on fishing jobs!
For Cable Tool data and catalog see your Spang dealer or write to:
SPANG & COMPANY
Dept. O-1 —:— Butler, Pennsylvania
For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Prospect Drilling and Shot Blast Holes.

along the Mississippian trend which is hoped someday will tie the Waterton Park region to the Castle River area for a field at least 14 miles in length. The newest success was drilled by Shell Oil Co., discoverer of gas in the area, and it lies 4 miles southeast of the discovery well. Texaco Exploration Co. has also been carrying out exploration in the Castle River region and now has two gas successes and another venture in its program is currently drilling.

Shell 2 Waterton Park, on LSD 7, 2-4-1w5, is the new gasser and it lies 9 miles southwest of the closest gas success in the Pincher Creek field, 18½ miles north of the International Boundary and 4 miles southeast of the Shell 1 Waterton.

Drill-stem to indicate discovery was conducted of a 200-ft. interval below the 10,700-ft. mark. Gas flowed to surface in 7 minutes and condensate was recorded in 32 minutes. Gas flow rate was measured at 3,100,000 cu. ft. daily and pipe recovery consisted of 537 ft. of condensate and 660 ft. of heavily gas-cut mud.

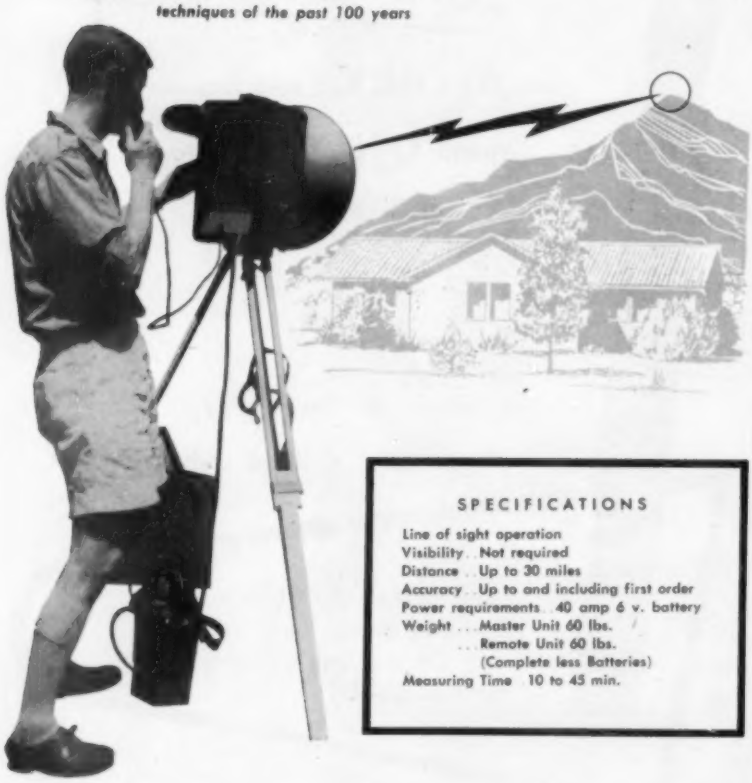
The initial discovery well during production test gave up a gas flow rate of, 6,000,000 cu. ft. per day and as well flowed 30 bbl. of condensate per million cubic feet of gas, or 180 bbl. per day.

This venture, like the previous Shell completion, lies on a spread of Petroleum and Natural Gas Reservation rights wholly-owned by the firm.

THIS IS THE TELLUROMETER

The instrument that has revolutionized distance measuring techniques of the past 100 years

The TELLUROMETER distance measuring technique utilizes microwave frequencies. Haze, mist, clouds, light rain do not prevent measurements. Operations can be conducted in daylight as well as darkness. Ideal for numerous survey uses, including traverse, picture points, base lines, trilateration road surveys and pipe line surveys. The TELLUROMETER is set up like a transit, is light in weight, rugged in construction and simple to operate.



SPECIFICATIONS

Line of sight operation
Visibility . . Not required
Distance . . Up to 30 miles
Accuracy . . Up to and including first order
Power requirements . . 40 amp 6 v. battery
Weight . . . Master Unit 60 lbs.
. . . Remote Unit 60 lbs.
(Complete less Batteries)
Measuring Time . 10 to 45 min.

For further information on technical data, utility, cost and delivery, write to:

TELLUROMETER, INC.
Dupont Circle Building
1346 Connecticut Ave., N. W., Washington, D. C.

Sales, distribution and maintenance by experienced geodetic and electronic engineers

BRITISH COLUMBIA

Northern Foothills Group Hits Gas in Bluesky

The Northern Foothills Agreement Group, which is comprised of Texaco Exploration Co., Shell Oil Co., Mobil Oil of Canada, Ltd., and the British American Oil Co., has recently completed another gas discovery well in its extensive drilling program in the northeastern sector of that province. The newest strike for the team occured at its 12 Buick Creek venture that lies 7 miles northeast of previous gas production, at its 11 Buick Creek venture, and almost 40 miles north of Fort St. John townsite.

After carrying the venture to total depth, production casing was set on it and an 18-ft. interval below 3,350 ft. was perforated in the Bluesky sector of the Gething horizon. On production test, through a 2-in. choke, the well flowed gas at the rate of 6,000,000 cu. ft. daily.

This group's activity in northeastern British Columbia is being carried out on large blocks of land, mainly in Permit form, and each company has a 25 per cent interest in it.

ILLINOIS BASIN

ILLINOIS

Kewanee Hits at Well West of Ina

In Jefferson County Kewanee Oil Co. completed the first well in the area 2 miles west of Ina. The 1 James Karber in NW SE SE 23-4s-2e pumped 240 bbl of oil per day from the McClosky at 2,772-78 ft.

Discovery Indicated Near Carmi

In White County, 4 miles southwest of Carmi, John R. Coombs, has set casing at the 1-A B. X. Zieren, SE NE NW 11-6s-9e. The O'Hara will be tested at 3,067-72 ft., the Rosiclare at 3,087-92 ft., and the McClosky at 3,108-25 ft. A drill-stem test at 3,060-3,160 ft. flowed oil in 2 hours and 45 minutes. Recovery was 2,545 ft. of oil, 180 ft. mud-mixed oil.

New Strike Seen Southwest of Galatia

In Saline County, 4 miles southwest of Galatia, Hal S. Lobree 1 Jess

6 Sound Answers to 6 Reasonable Questions about TODAY'S GASOLINE!

Most Americans think of the oil industry in terms of gasoline. The better they understand gasoline – the better they understand you and your industry. So keep your friends and customers informed by keeping yourself informed about *the facts of today's gasolines!*

Q. Why has the price of gasoline gone up in the past 5 years?

A. Like everything else, gasoline has gone up in price—but very little. Big boosts in gasoline quality have more than made up for the small increase in price. And, of course, taxes on gasoline have gone up, too.

Q. Just how much are these gasoline taxes?

A. Direct taxes—Federal and State—now add 8.9¢ (national average) to the price of every gallon of gasoline. This adds 40¢ to every dollar spent for today's gasoline.

Q. And how much has the price of gasoline gone up?

A. The actual price of the gasoline itself has risen less than 6% in the past 5 years. Compare that with the price increases on other items you buy every day.

Q. What are these big boosts in gasoline quality?

A. Well, today's "regular" gasoline is as good as "premium" gasoline was just 5 years ago.

Q. And what about today's "premium" gasoline?

A. Today's "premium" is as powerful as fighter plane gasoline at the end of the last war.

Q. Why do I need these "higher-powered" gasolines?

A. Today's powerful engines demand these improved fuels for efficient operation. The gasoline of your father's day would be completely inadequate in today's modern car.

With Today's Gasoline YOU DRIVE THE BEST BARGAIN IN YEARS!

Clip this coupon for more information about today's gasoline and your industry!

American Petroleum Institute, Dept. G
50 W. 50th St., New York 20, N. Y.

I would like to obtain more information about today's gasoline quality, prices and taxes. Please send me your FREE booklets.

NAME _____

ADDRESS _____

CITY _____ **ZONE** _____ **STATE** _____

LARKIN TUBING HEADS *unmatched*

FOR DEPENDABILITY

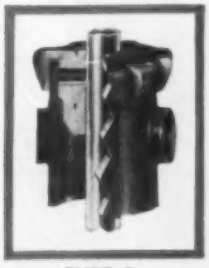
The Larkin Type SR Tubing Head is a slip suspension head, equipped with a Neoprene Stripper which serves as a blow-out preventer and oil saver while tubing is being pulled or run. It is very suitable where higher pressures might be encountered.

FOR VERSATILITY

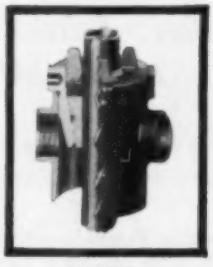
The Larkin Type R Tubing Head is a conversion from the Type SR Head. This ease of conversion makes it possible to use the same stripper adapter and Neoprene stripper when working on any well equipped with a Larkin Tubing Head.

FOR ECONOMY

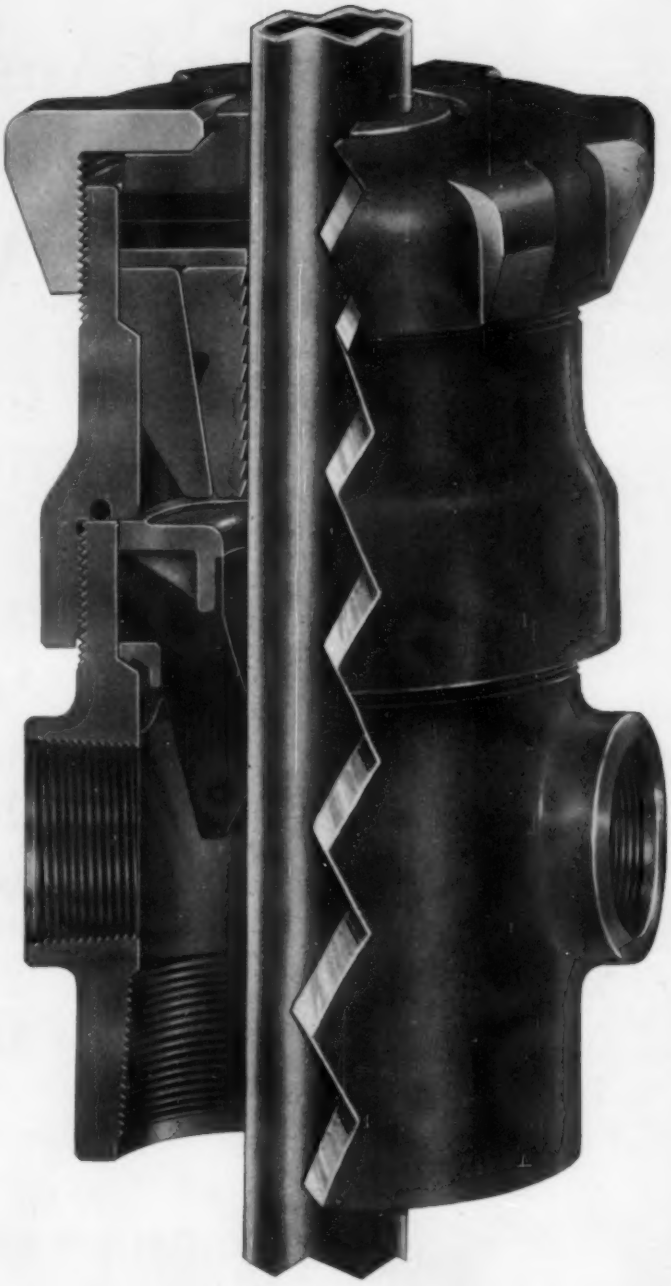
A new member of the Larkin Well Head Line, the Type L Tubing Head fills a need in low pressure areas where economy may be effected with complete safety. It is forged steel construction, full opening, 2000 lb. psi, top of body threaded 7" API to accommodate control equipment, hinged three-segment slips, 2" or 3" side outlets.



TYPE R



TYPE L



For detailed information on these and other Larkin Tubing and Casing Heads, please refer to your Larkin Catalog or talk to your Larkin Representative. All Larkin Equipment is available through your supply store.

LARKIN PACKER COMPANY, INC.

WAXAHACHIE, TEXAS

LARKIN

...Through Your Supply Store

PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Clarida, SE NE SE 20-8s-5e, is an indicated discovery.

The operator has set casing to test the Cypress sand at 2,611-21 and the Aux Vases sand at 2,899-2,915 ft. A drill-stem test at 2,610-21 ft. got 540 ft. of gas, 140 ft. clean oil, and 2 ft. mud. Another test at 2,900-16 ft. recovered 2,340 ft. of gas, 30 ft. mud-mixed oil, and 35 ft. of oil-mixed mud.

LOUISIANA

SOUTH

Deep Gasser Completed At Little Bayou Pigeon

A wildcat located 1½ miles northwest of Little Bayou Pigeon field, in Iberia Parish's eastern arm, has proved productive of gas and condensate in sand at 12,200-12 ft. Production at Little Bayou Pigeon field, discovered by Continental Oil Co. in 1955, is from a 7,400-ft. sand with two wells.

The new discovery is by Ocean Drilling & Exploration Co. at its 1 Williams, Inc., in 3-12s-10e. It tested 3,320,000 cu. ft. of gas per day through ⅝-in. choke. Liquid recovery was at the rate of 63 bbl. of 49°-gravity condensate per day. Pressure was 4,200 psi. The well had been drilled to 12,428 ft.

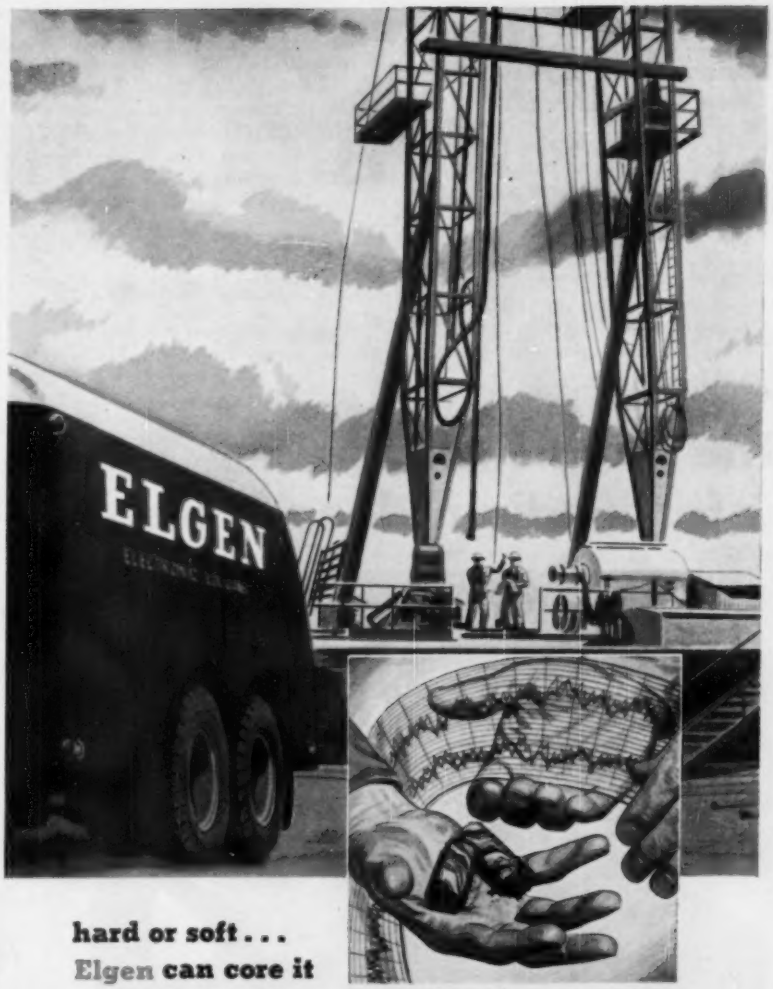
Production Spreads in Lake Washington Area

The Texas Co. is completing a good discovery well in the Lake Washington area, Plaquemines Parish. It is its 3 State-Cockrell Unit 4, in 32-20s-27e, which flowed 108 bbl. of 25.1°-gravity oil during a 3-hour gage through 7/64-in. choke. Flow was with pressure of 1,250 psi. and gas-oil ratio of 338 cu. ft. per barrel. Pay is perforated at 9,579-86 ft. and 9,593-98 ft. Nearest production is about 2 miles north.

Olin Discovery Opens New Terrebonne Field

Olin Oil & Gas Co. has a new deep gas discovery about 6 miles southwest of Houma, in Terrebonne Parish. Its discovery well, 1 Sylvester Brien, flowed 4,358,000 cu. ft. of gas during a 12-hour gage through 13/64-in. choke. Liquid recovery was 13.3 bbl. per 1,000,000 cu. ft. Pressure was 4,250 psi.

The well was drilled to 13,521 ft. Pay is perforated at 11,973-83 ft. Location, in 32-1s-17e, is 5 miles from nearest other production.



hard or soft . . .
Elgen can core it
FASTER | BETTER | SAFER

Elgen controlled-depth cores give a closer look at production possibilities.

Elgen's side wall core services are the finest in the field. 1 to 30 zone selections in one trip . . . cores large enough for accurate analysis. Gun loading simplicity eliminates bulky field equipment, adds to speed of operation. Automatic gauges assure knowledge of tool operation. Exclusive circuit design and maximum safety devices are featured.

Remember — you'll get FASTER, BETTER, SAFER coring results with Elgen . . . and at less cost.

Write or call today. Your nearest Elgen representative, or Elgen's home office, will be pleased to show the many advantages in Elgen core services.

THE **ELGEN** CORPORATION
2925 MERRELL ROAD / DALLAS, TEXAS
Fleetwood 7-3958

MICHIGAN

Isabella Wildcat May Open Traverse Pool

An exploratory test in basin area played off and on since 1946 held promise as Traverse lime pool opener as top Michigan development. McClure and Collin 1 Lurwig NE SW 32-13n-5w, Isabella County, carried 1,200 ft. of oil in 21 hours from Traverse lime section at 3,070-72 ft. Operators plan to set 5-in. casing on packer for production test. Traverse lime top was reported at 3,041 ft., elevation 908 ft.

Wildcat is locted 3 miles northeast of Edmore-Home Traverse pool in Montcalm County, and was drilled on Socony-Mobil farmout acreage. Six previously drilled tests in area failed to show commercially.

NEVADA

Clark County Activity

Bonanza Oil Co. was waiting on 9¾-in. casing to set in 1 Consolidated, a wildcat being cable tool drilled about 12 miles southeast of Las Vegas. The present depth was 810 ft.

Meanwhile, U. S. Oil Co. and Red Rock Oil & Gas Co. announced plans to rework the previously abandoned 2,026-ft. 1X Wilson 12 miles southwest of Las Vegas.

NORTH DAKOTA

Burke County Discovery Completed in Nesson Pay

The 1 Nygaard Nesson-Mississippian discovery was completed in SE SE NE 29-163n-90w, Burke County, by Petroleum Corp. of America and Tom Jordan, Jr., for 50 bbl. of oil per day. Perforations were at 5,735-45 and 5,724-34 ft.

This newest addition to the growing list of new fields in Burke County's Lignite area is 1½ miles north of Flaxton town and is more than 2 miles from previous drilling. It is the easternmost strike in the current play.

Production string has been run at the 1 Anderson, ¼ mile to the southwest in C NW SE 29-163n-90w.

OKLAHOMA

SOUTHWEST

Deep Knox Wells Nearing Completion

The ultra-deep drilling campaign in Carter-Knox field in Stephens and Grady counties is gaining momentum. British-American Oil Producing Co. is testing gas flows at three separate deep wells in the area.

- The 1 Krieger, C SW SW 3-2n-5w (Oklahoma's deepest producer) made 3,200 M.c.f. of gas per day on ⅛-in. choke from perforations in the second Bromide-Ordovician at 14,804-82 ft. and in the third Bromide sand at 15,034-84 and 15,134-68 ft. On a 14/64-in. choke the well flowed 4,710 M.c.f. per day and on 20/64-in. it made 9,800 M.c.f. per day.

- The 1 Brickel, C SW NE 4-2n-5w, flowed 1,200 M.c.f. of gas per day through open hole at the 15,173-ft. mark on ¼-in. choke plus 31 bbl. of condensate in 5 hours.

- The 1 Baker, SW SW NE 33-3n-5w, flowed 720 M.c.f. of gas per day and 10 bbl. condensate in 5 hours. Calculated flow on 4/64-in. choke is 2,500 M.c.f. per day. All these wells

The engine to consider for medium-deep wells

This gas-gasoline engine is rated from 7 hp at 350 rpm to 15½ hp at 750 rpm for continuous 24-hour operation. It starts easily, is built for long operating life, and requires very little maintenance. Its dust-tight, weather-resistant construction permits operation under extreme weather conditions. Should natural-gas supply become depleted, this engine can easily be converted to diesel fuel . . . an additional protection for your investment.

We will gladly send you further information on all Witte Engines, or you may visit your supply store.

WITTE ENGINE WORKS, OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORPORATION
Kansas City 26, Mo.

USS

WITTE ENGINES

Gas-gasoline models 4 to 15½ hp. Full diesel models 3¾ to 12½ hp.

UNITED STATES STEEL

TIRED OF PULLING CHEWED-UP TUBING?

If you're losing sleep over the profits you leave in the hole every time you pull ruined tubing string from a highly corrosive gas lift or water drive well, it's time you followed the example of those operators who have virtually eliminated such costly waste by installing tubing strings protected by a suitable baked-on Plasticap coating.

Plasticap coatings give you top to bottom protection and the first cost is the last. It has proved itself again and again in wells where the large volumes of fluids produced necessitated frequent replacement of uncoated tubing.

ARRANGE A CONFERENCE WITH ONE OF OUR 16 FIELD SERVICE REPRESENTATIVES!

Plastic Applicators, Inc.

TUBULAR GOODS INSPECTION SERVICES
BAKED-ON PLASTIC COATINGS

HOME OFFICE AND PLANT: Houston, Texas, P. O. Box 7631. Phone UN 9-2491

BRANCH OFFICES AND PLANTS: Harvey, La., P. O. Box 388. Phone FIlmore 1-1636. Odessa, Texas, P. O. Box 2749. Phone EMerson 6-4491.

SALES OFFICES—TEXAS: Houston, Corpus Christi, Dallas, Midland, Odessa. **LOUISIANA:** Lafayette, New Orleans, Harvey. **NEW MEXICO:** Hobbs. **MEXICO:** Mexico City. **BRITISH WEST INDIES:** Trinidad.

are producing in the Ordovician Bromide sands. The Krieger discovery earlier became the state's deepest hole in the Oil Creek at 16,546 ft.

NORTHWEST

Woodward County Gets First Oil Production

Oil production was established in Woodward County at Pan American Petroleum Corp. 1 Dean, C SW NE 3-21n-21w, 7 miles southeast of the city of Woodward. Production is from the lower Tonkawa - Pennsylvanian sand. Daily oil output was 48 bbl. and 12 bbl. of water. Pump will be installed. Previous production in this county has been gas-distillate and gas.

Big Oil Well Finished In Southeast Stockholm

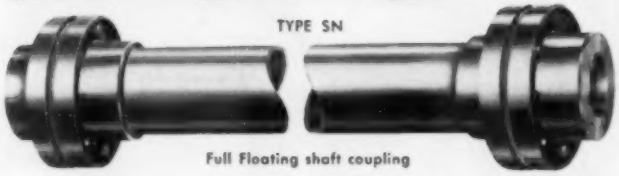
United Producing Co. completed a prolific oil well iin Southeast Stockholm field, Harper County. The well flowed 60 bbl. of oil per hour from lower Tonkawa-Pennsylvanian sand at 5,496-5,512 ft. After fracturing it flowed an estimated 1,440 bbl. per day on 1-in. choke. Location of the 4 E.E.E. Campbell is NW SE 20-6n-23w.

Protect Your Machinery with

THOMAS FLEXIBLE COUPLINGS

ALL METAL

NO LUBRICATION | NO MAINTENANCE | NO WEARING PARTS



Full Floating shaft coupling

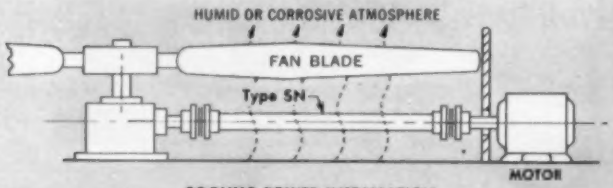
REFINERS! PIPE LINE MEN! DRILLING ENGINEERS! LABORATORY TECHNICIANS!

Thomas Couplings are used to advantage on Pumps, Compressors, Cooling Towers, Rigs or any other tough job where continuous operation and dependability are required.

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance



COOLING TOWER INSTALLATION

In the typical cooling tower installation shown above, the motor — outside the humid or corrosive atmosphere — is connected by a floating-shaft coupling to the gear box under the large slow-speed, horizontal-blade fan.

Write for engineering catalog 51A, and the name of your nearest Thomas representative

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

PANHANDLE

Morrow Discovery Reported Inside Hugoton Field

Another Morrow-Pennsylvanian discovery was reported inside the limits of huge Hugoton-Permian gas field in Texas County. The discovery well is Cities Service Oil Co. 1 Stelzer, C NE SW 11-4n-14eCM, 5 miles west of the Murdock discovery that was recently offset by a big gas strike (205,000 M.c.f. per day).

The 1 Stelzer flowed as much as 7,650 M.c.f. per day on test of the Morrow at 6,167-6,202 ft.

Keyes Gas Field Extended 2 Miles East

Panhandle Eastern Pipeline Co. has extended Keyes field in Cimarron County 2 miles east and ¼ mile south at its 1 Reiss, C NW NW 11-5n-10eCM. The well flowed both oil and gas on drill-stem test at 4,458-85 ft. Gas flow was gaged at 2,972 M.c.f. per day. Location is ½ mile northeast of Carthage.

High Flowing Well Finaled In North Hardesty Field

Panhandle Eastern Pipeline Co. completed 1-23 Beasley "B" in North Hardesty pool, inside Hugoton field in Texas County, for 58,307 M.c.f. of gas per day from Morrow sand at 6,218-30, 6,230-42, 6,242-52 and 6,288-93 ft.

Highland Field Well Completed for Gas

United Producing Co. completed its 7 Harry Carlisle in Highland field, Beaver County, for a calculated open flow potential of 21,500 M.c.f. per day. Hoover pay was at 4,284-4,304 ft.

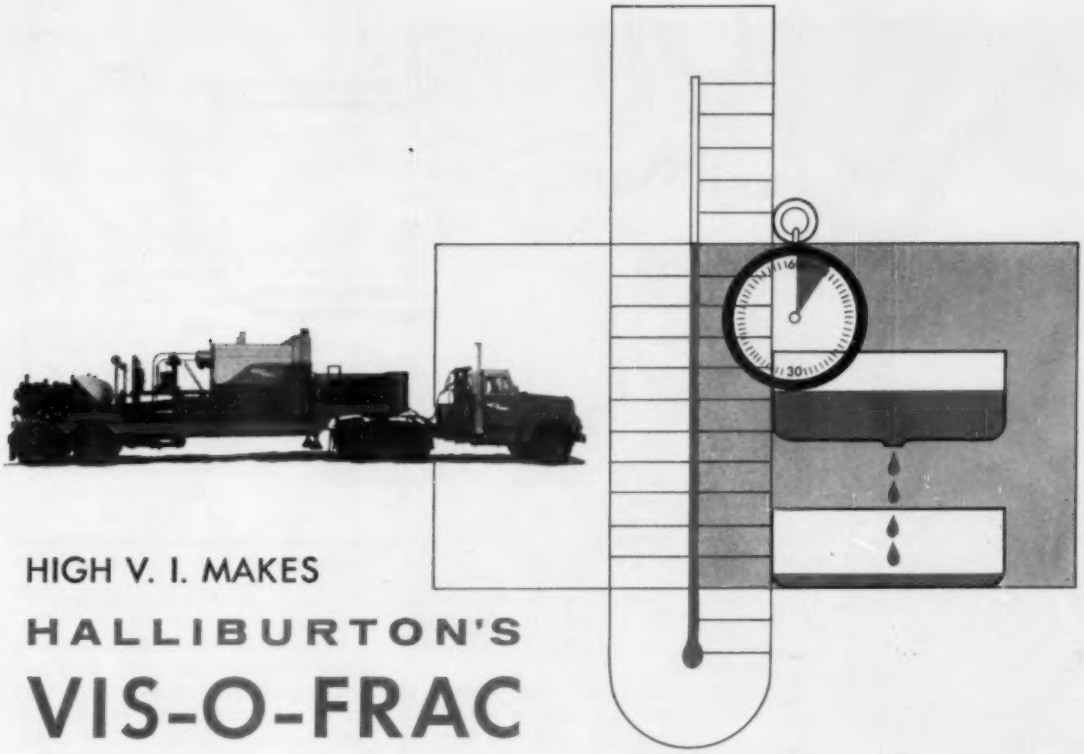
SOUTH-CENTRAL

Southwest Ladd Field Confirmed By Superior

Superior Oil Co. has confirmed Southwest Ladd pool in McClain County.

The 1 Walker flowed 165 bbl. of oil in 13¼ hours on various size chokes. Perforations were in the Oil Creek sand at 9,267-74 and 9,280-90 ft. The well also made some oil in the first Bromide sand, another Ordovician pay.

The 1 Walker is the north confirmation well to Southwest Ladd pool.



HIGH V. I. MAKES

HALLIBURTON'S VIS-O-FRAC

BETTER FOR DEEPER FRACTURING

The high viscosity index of VIS-O-FRAC makes it particularly effective for fracturing deep wells with above average bottom hole temperatures. Because changes in the viscosity of VIS-O-FRAC are relatively small with temperature changes, it has been very successful in fracturing these deeper "problem wells"... resulting in profitable production.

VIS-O-FRAC is not only effective... it is economical. The fluid used in VIS-O-FRAC is a native crude or light petroleum base gel ... inexpensive, low in friction coefficient, yet viscous enough to suspend high sand concentrations and to guard against settling out. Because Halliburton's VIS-O-FRAC dilutes easily after fracturing and is compatible with almost all types of formation crudes, your wells are returned to production quickly after treatment.

Check with Halliburton for more information about VIS-O-FRAC. The Halliburton representative in your area will give you the facts.

HALLIBURTON

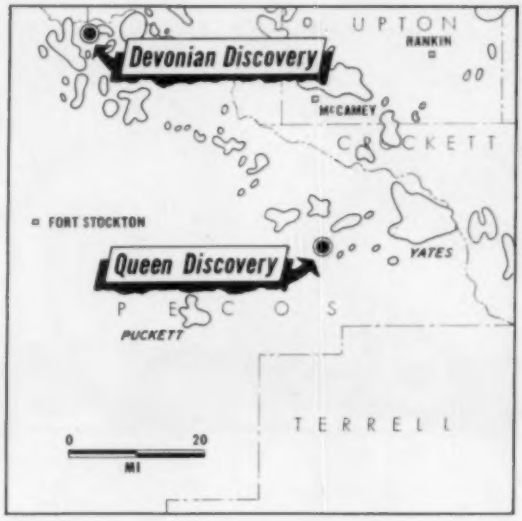
OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

THE PIONEER IN FRACTURING SERVICES

284 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY WELL

Pecos Valley Area Gets Devonian Production



Pecos County operators reported final tests at two pool openers, one in the Devonian and the other in Queen sand.

COMPLETIONS last week included a Devonian pool opener in northern Pecos County, between shallow Permian fields, and a Queen sand discovery near Yates field in the eastern portion of the same county.

The deep well was American Trading & Production Corp. and Associates 1 Pecos County Water Improvement District 3, in Section 11, Block 9, H&GN Survey. Completion potential of 386 bbl. a day was based on a 12-hour flow test through 14/64-in. choke of 193.18 bbl. of oil. Gravity was 38°, gas-oil ratio checked 800:1 and flowing tubing pressure was 720 psi. Perforations were in the Devonian at 5,576-5,625 ft.

Location of the discovery is 5½ miles west of the town of Imperial, and about midway between Permian production in Pecos Valley and Malicky fields. Nearest Devonian production is about 4 miles to the south, and slightly west, on the eastern edge of Pecos Valley field.

Operators called top of the Devonian at 5,404 ft. on elevation of 2,406 ft. Total depth was 5,943 ft. The well also indicated oil production from the Queen sand, when it flowed an unreported amount of oil and gas while drilling, at 2,074 ft. and again at 2,610 ft.

Queen discovery . . . Texas American Oil Corp. and Haskens and Knickerbocker, Midland firms, have completed their 1 Omar Khayyam as a Queen sand discovery 17 miles west of Iraan.

The well flowed and pumped to make a daily potential of 165 bbl. of 31.8°-gravity oil, from perforations at 2,000-12 ft.

Location is on a 320-acre lease in the southeast corner of Section 98, Block 194, GC&SF Survey. According to the company, there is spacing for 15 additional wells on the property and development drilling will start shortly.

Final Flow Test Made on Sutton County Gasser

Operators have announced potential tests on a big gas strike in the Allison area of northeastern Sutton County. Completion was dual, from the Canyon and Strawn sections of the Pennsylvanian.

The well is Jocelyn-Varn, of Wichita, Kans., 1 Stella Lloyd, in Section 25, Block K, GH&SA Survey, 17 miles northeast of Sonora.

Potential on the Strawn reef was 120,000 M.c.f. of gas a day, from perforations at 4,593-4,638 ft. Gage on the Canyon was 35,000 M.c.f., from perforations at 3,750-3,810 ft. Pressures were not reported. The project was shut in pending pipeline connections.

Jocelyn-Varn's dual gas discovery in northeastern Sutton County.

FOR FAST, ACCURATE MEASURING

The Model 600

Rolatape

Measuring Wheel

Is ideal for measuring leasehold improvements, pipe laying, exploration—and many other needs.

Here is the answer to all your outdoor measuring! Taking long distance and acreage measurements is tremendously simplified when you tow the Rolatape Model 600 from the rear of your vehicle. Simple to operate, the Rolatape is scientifically calibrated for accuracy and its durable construction guarantees long service. See your nearest Rolatape dealer or write today for complete information.

Rolatape Inc. 1741 14th St. Santa Monica, Cal.

TEXAS

PANHANDLE

Two Cisco Wells Completed In Dalhart Basin

Rip C. Underwood completed 1 Peeler in northeastern Dallam County in the Dalhart basin as a Cisco-Pennsylvanian gas discovery 4 miles southeast of Kerrick. The well flowed 24,000 M.c.f. of gas per day from perforations in the Cisco at 3,496, 3,486, 3,446, 3,434, and 3,404 ft.

Location of this new discovery is 5½ miles east of Kerrick field in Section 49, Block I-T, T&NO Survey.

Underwood also completed 1 Moon in northeastern Dallam County for 6,400 M.c.f. of gas per day in the Cisco. Location of this strike is 6 miles south of Kerrick town in Section 87, Block I-T, T&NO Survey.

GULF COAST

San Patricio Wildcat Tests Good Oil Flow

Farenthold & Pitcairn are completing a good oil-discovery well northeast of East Riverside field, in southwestern San Patricio County. The well, 1 Vera McKeown, flowed 113 bbl. of 38°-gravity oil on a 12-hour test through ⅝-in. choke before being shut in for additional storage. Flowing pressure was 150 psi. on the tubing. Completion is in Frio sand at 6,109-14 ft. in hole drilled to 7,500 ft. Location is 5 miles south of Edroy.

Two Zones Proved in Kellers Bay Wildcat

A new gas area is being opened south of Olivia, in Calhoun County. Its discovery well, drilled by Edwin L. Cox, C. G. Glasscock, and Tidelands Oil Co. is offshore in State Tract 81, Kellers Bay. Location is about 2 miles east of Kellers Bay field and about the same distance south of Olivia field.

Completion is in two Frio sands, one perforated at 8,590-98 ft., and the other at 8,432-40 ft. The lower zone is rated good for 22,000,000 cu. ft. of gas per day on open flow. Its pressure, shutin, is 3,818 ft. The upper pay flowed at the rate of 9,200,000 cu. ft. per day. Through 9/64-in. choke, pressure was 3,450 psi.

Tidewater Oil Co. has applied for permits for a north offset in Tract 80 and a south offset in Tract 82.

You can't beat R/M VEE-SQUARE* for heavy duty reciprocating service

*Patented

Where conditions in the oil fields are toughest — on mud pumps, steam hammers, high-pressure lubricators, and special hydraulic equipment — R/M Vee-Square® outperforms them all. It has positive nonyielding properties . . . assures automatic sealing . . . needs no sensitive gland adjustments . . . and permits unrestricted use of gland pressure.

Patented R/M Vee-Square has these special built-in features:

1. Gland pressure is absorbed by the solid square section. The packing can not roll or ride the rod.
2. Automatic sealing is assured by the V design.
3. Blow-by is prevented by the soft rubber cushion between the rings.

R/M VEE-SQUARE KEEPS NEW RODS NEW LONGER

For complete information on R/M Vee-Square, write today for booklet shown

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex, Vee-Square, Universal Plastic, and "versi-pak"®; GASKET MATERIALS, "TEFLON"† PRODUCTS. SEE YOUR R/M DISTRIBUTOR.

†Du Pont trademark

R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N.J.
MECHANICAL PACKINGS AND GASKET MATERIALS

FACTORIES: Passaic, N.J.; Bridgeport, Conn.; Manheim, Pa.; Neenah, Wis.; No. Charleston, S.C.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Mechanical Packings • Asbestos Textiles • Industrial Rubber • Engineered Plastics Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks Clutch Facings • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

From New York . . . From Houston
From Miami . . .

FLY KLM
Finest and Fastest to the
OIL CENTERS
OF THE WORLD

Serving 118 cities in 74 countries, KLM Royal Dutch Airlines offers unexcelled service to the great oil-producing centers of the world. From New York via giant DC-7C's or from Houston, Texas on the new DC-7C "Royal Texan," you enjoy traditional Dutch hospitality on your way to all Europe, the Near, Middle and Far East. From New York or Miami, direct flights to Curacao, the gateway to South America.

KLM also offers fast, expert cargo service across the Atlantic to all the world. For your personal transportation *and* for personalized air cargo service . . . Choose KLM . . . You'll agree . . .

It's a Treat to go Dutch

SEE YOUR TRAVEL AGENT
or nearest KLM office.

KLM
ROYAL DUTCH AIRLINES

SOUTHWEST TEXAS

Pescadito Salt Dome Gets New Deep Test

Ginther, Warren & Ginther are getting ready to drill another deep test on the deeply-seated Pescadito salt dome in Webb County. Location, 14 miles northeast of Laredo, is 7,700 ft. northwest of their initial test abandoned last August at total depth of 15,107 ft.

Their initial test proved this long-recognized large geological feature to be a salt dome by drilling into salt, topped at 15,079 ft. It also encountered promising gas showings in several overlying formations, but a succession of tests failed to develop commercial production.

Gulf Oil Corp. and Michel T. Halbouty will be associated with the operators in this new venture, designated as 1-A Killam and projected to 16,500 ft. Location, in Section 1807, GC& SF Survey, is farther off the dome than the initial test, and at the projected depth, operators hope to get to the Edwards formation, original objective of the first test.

Successful Wildcats

ALBERTA

Home et al Regent 11-19 Edith Lake, LSD 11, 19-67-10w5. TD 9,572 ft. Beaverhill Lake oil well.

H.B. et al 10-28-41-13 Schneider Lake, LSD 10, 28-41-13w4. TD 3,555 ft. Viking oil well.

T.G.T. 10-25-56-9 Ronan, LSD 10, 25-56-9w5. TD 5,188 ft. Pekisko oil well.

LOUISIANA OFFSHORE

Lafourche Parish: Gulf Oil Corp. 1-B OCS-0462, Block 135, South Timbalier area, Gulf of Mexico. IP 300 BOPD, 5/32-in., 31.5°, GOR 4,410 cu. ft. per barrel, TP 3,150 psi., perforations 10,426-28 ft. TD 14,648 ft. (New pay in South Timbalier Block 135 field.)

Phillips Petroleum Co. 2-B OCS-0223 (State Lease 1369), Block 5, Bay Marchand area, Gulf of Mexico. IP 5,250 M.c.f. daily, ¼-in., GOR 142 M.c.f. per barrel, 55.6°, TP 3,600 psi., perforations 11,240-46 ft.; 4,900 M.c.f. daily, ¼-in., GOR 100 M.c.f. per barrel, 52.8°, TP 3,300 psi., perforations 10,668-75 ft.; and 4,600 M.c.f. daily and 112 BOPD, ¼-in., 51°, TP 3,250 psi., perforations 11,097-11,106 ft. and 10,856-62 ft. TD 12,735 ft. (New field triple completion.)

Terrebonne Parish: Ocean Drilling & Exploration Co. 5 State Lease 1527, Block 67, Ship Shoal area, Gulf of Mexico. IP 2,200 M.c.f. daily and 54 BOPD, ⅛-in., 49.2°, TP 4,500 psi., perforations 12,150-62 ft. TD 12,325 ft. (New pay in Ship Shoal Block 67 field.)

NORTH LOUISIANA

Concordia Parish: Marlin Exploration, Inc. 1 Magee-Evans, NWc 43-6n-9e. IPF 96 BOPD, 24° gravity, Sparta 3,224-25 ft. TD 6,813 ft. North Deer Park pool discovery, tentatively.

FIRST 500-ton Capacity Elevator!

FIRST 500-ton Capacity Spider!

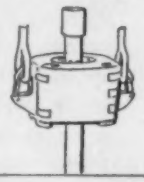
FIRST Combination Elevator & Spider!

Introducing BJ's NEW 500-ton Elevator-Spider

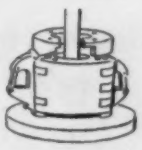
This tremendous new tool serves as either a casing elevator or as a casing spider. Its 500-ton capacity gives it a super-strength grip for holding the heaviest string of casing ever run or contemplated. Yet it is so simple and so functional that it can be easily operated by one man. Interchangeable slip assemblies and inserts make it capable of handling all casing sizes from 4½" to 10¾". This 5000-pound giant is designed for the deep drilling operations of today and of the future.

Write for bulletin containing complete specifications.

USED AS AN ELEVATOR



USED AS A SPIDER



WATCH BJ FOR THE NEWEST

Byron Jackson Tools, Inc.

A SUBSIDIARY OF BORG-WARNER CORPORATION

P.O. Box 2017A, Terminal Annex, Los Angeles 54, California • Cable: "BJTOOL"
Export Address: 580 Fifth Avenue, Suite 510, New York 36, New York

SOUTH LOUISIANA

Allen Parish: Thomas Jordon, Inc., 2-A Industrial, 29-6s-6w. IP 500 M.c.f. daily, 3/32-in., TP 2,400 psi., perforations 7,652-55 ft. TD 8,193 ft. (Second well and new pay in East Reeves field.)

Iberville Parish: Aluminum Co. of America 1 Schwing, 43-8s-11e. IP 454 BOPD, ⅞-in., 36°, GOR 676 cu. ft. per barrel, TP 1,900 psi., perforations 11,224-30 ft. TD 12,021 ft. (New field—3½ miles northwest of Bayou Choctaw field.)

Plaquemines Parish: Union Producing Co. and Sohio Petroleum Co. 10 Tambour, 34-22s-31e. Shut-in gas well, no gage, perforations 8,165-70 ft. TD 8,500 ft. (New pay in Felice Bayou field.)

St. Martin Parish: Texas Pacific Coal & Oil Co. 1 Domengeaux, 57-11s-6e. IP 168 BOPD, ⅛-in., 35.6°, GOR 480 cu. ft. per barrel, TP 925 psi., perforations 6,492-95 ft. TD 7,475 ft. (New pay in St. Martinville field.)

Vermilion Parish: Fifteen Oil Co. and Bel Oil Co. 1 Caldwell, 27-14s-4e. IP 102 BOPD, ⅛-in., 39°, GOR 5,490 cu. ft. per barrel, TP 2,500 psi., perforations 11,336-40 ft. TD 14,600 ft. (New pay in Boston Bayou field.)

TEXAS GULF COAST

Bee County: Atlantic Refining Co. 1 Ottar Beck, Section 15, W. G. Ragley Subd., Chittam-Miller Ranch, Jose Maria Uranga Sur., A-68. IP 29,500 M.c.f. daily, absolute open-flow potential. GLR 13.3 M.c.f. per barrel, 47.4°, shut-in pressure 5,138 psi., perforations 9,482-9,530 ft. (Wilcox-Massive sand, and (dual completion) 59,000 M.c.f. daily, absolute open-flow potential, GLR 52.9 M.c.f. per barrel, 50.6°, shut-in pressure 4,693 psi., perforations 8,768-77 ft. (Wilcox-Slick sand). TD 9,650 ft. (New pays in Normanna field.)

Coastal States Gas Producing Co. 1 Crow, Samuel Allen Sur. Shut-in gas well, no gage, perforations 3,795-3,800 ft. (basal Frio). TD 4,250 ft. (New gas reservoir 1 mile northwest of Linke gas field.

Goliad County: S. H. Howell 1-A Albrecht, George Wright Sur., A-302. IP 5,600 M.c.f. daily, absolute open-flow potential, GLR 152.2 M.c.f. per barrel, 63°, shut-in pressure 1,772 psi., perforations 4,812-18 ft. (Yegua), and (dual completion) 5,100 M.c.f. daily, absolute open-flow potential, GLR 320.6 M.c.f. per barrel, 69°, shut-in pressure 1,582 psi., perforations 4,608-14 ft. (Pettus). TD 4,991 ft. (New pays in Karan Beauchamp East Albrecht area.)

Galveston County: Phillips Petroleum Co. 1 O'Daniel Unit, Lot 462, Alta Loma Subd., Lemuel Crawford Sur. IP 7,000 M.c.f. daily, absolute open-flow potential, GLR 15.3 M.c.f. per barrel, 52°, shut-in pressure 9,120 psi., perforations 14,656-73 ft., 14,680-90 ft., 14,692-98 ft., 14,706-18 ft., and 14,740-47 ft. (Frio). TD 15,500 ft. (New pay in Alta Loma field—deepest production in District 3.)

Harris County: Trice Production Co. 1 City Prison Farm, Joseph Kopman Sur., A-812. IP 111 BOPD, ⅛-in., 37°, GOR 801 cu. ft. per barrel, TP 950 psi., perforations 8,786-92 ft. (Vicksburg). TD 8,861 ft. (New pay in Mykawa field.)

Jefferson County: Michel T. Halbouty and Pan American Petroleum Corp. 1 Rosen et al, William McFaddin Sur. 8, A-418. IP 78,000 M.c.f. daily, absolute open-flow potential, GIR 15.35 M.c.f. per barrel, 48.8°, shut-in pressure 7,368 psi., perforations 10,696-10,704 ft. (Lower Hackberry). TD 11,460 ft. (Second well and new pay in Port Acres field.)

Madison County: T. C. William 2 Heath, Z. Robinson League, A-28. IP 304 BOPD, 3/16-in., 31.8°, GOR 724 cu. ft. per barrel, TP 950 psi., perforations 9,325-30 ft. (2nd Upper Dexter sand). TD 9,370 ft. (New pay in Madisonville field—east extension area.)

Polk County: Oil Reserves Corp. 1-K Kirby-Stephenson, James Stephenson Sur., A-523 (5 miles northeast of Votaw). IP 68.9 BOPD, 7/32-in., 38°, GOR 353 cu. ft. per bbl., TP 200 psi., perforations 5,379-81 ft. (Cockfield). TD 6,856 ft. (New field 1 mile southwest of West Segno field—Menark Creek.)

San Patricio County: W. Rinehart Miller 1 Morris, Section 71, George H. Paul Subd., Coleman-Fulton Pasture Co. Lands (1 mile southeast of Taft). IP 45.71 BOPD, ⅛-in., 35°, GOR 325 cu. ft. per bbl., TP 500 psi., perforations 5,881-84 ft. (Frio). TD 6,271 ft.

Tyler County: J. C. Bonham 1 Kountz Estate, Lot 11, Emily Smith Sur., A-792. IPP 20 BOPD, 23°, perforations 1,122-27 ft. (McElroy). TD 1,453 ft. (New reservoir in, and revives depleted Rockland field.)

Victoria County: Harkins & Co., George A. Musselman et al 1 Mernitz, Thomas H. Bell Sur., A-29. IP 125.29 BOPD, ⅛-in., 36.8°, GOR 810 cu. ft. per barrel, TP 870 psi., perforations 8,328-31 ft. (First Massive Wilcox stringer). TD 8,520 ft. (New pay in North Mission Valley field.)

Wharton County: C. C. Winn 1 Ammann, Nasario Mancha Sur., A-271. IP 50,000 M.c.f. daily, absolute open-flow potential, shut-in pressure 1,725 psi., per-

STEEL

Carbon—bars, structurals, plates, sheets, tubing, etc.

Stainless—pipe, tubing, sheets, plates, bars, etc.

Alloy—pretested, heat-identified alloys, including case and direct hardening, heat-treated, and Rycut free-machining leaded alloys.

...FROM THE NATION'S LARGEST STOCKS

Steel stocks unmatched in size or variety are only part of Ryerson service. Call on Ryerson for fast, accurate processing . . . for flame-cut steel shapes in any quantity . . . for industrial plastics—PVC, Kralastic, polyethylene . . . for dependable quality at fair prices . . . for fast service on every order.

Other Products Include: safety plate • grating • expanded metal • chain • wire rope reinforcing bars • pipe and tubing • machinery and tools

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA CHARLOTTE • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

forations 4,165-70 ft. TD 4,703 ft. (New field.)

SOUTHWEST TEXAS

Dimmit County: Star Falcon Oil Co., Inc., 1 Halsell, Section 48, Block 10 I&GN Sur., A-932. IP 2,800 M.c.f. daily, absolute open-flow potential, dry gas, shut-in pressure 850 psi., perforations 1,866-70 ft. (Navarro). TD 2,740 ft. (New field—12 miles northwest of Carrizo Springs.)

Duval County: Russell Maguire 2-B Clara Driscoll Estate, Section 55, Santa Rosalie Grant. IP 100.52 BOPD, 19/64-in., 34.1°, GOR 125 cu. ft. per barrel, TP 55 psi., perforations 3,288-98 ft. (Loma Novia). TD 3,360 ft. (New oil reservoir in Rosalie area.)

Jim Hogg County: Humble Oil & Refining Co. 1-H Mestenas, San Antonio de Baluarte Grant, A-276 (10 miles southeast of Hebbronville). IP 72 BOPD, ⅛-in., 47.4°, GOR 757 cu. ft. per barrel, TP 500 psi., perforations 5,397-5,401 ft. (Yegua). TD 6,700 ft. (New field.)

Maverick County: T. G. Shaw 1 Annie E. Chittim, Section 131, Block 7, I&GN Sur., A-333. IP 110 BO in 14 hours, ¼-in., 15°, basal Austin chalk, open hole, TD 1,442 ft. (New oil reservoir in Chittim area—well tried to blow out while drilling at 1,442 ft.—completed with hole open from 201 ft.).

T. G. Shaw 2 Chittim, Section 131, Block 7, I&GN Sur., A-333. IPP 2.32 BOPD, 34°, Buda lime 2,395-2,400 ft., open hole, TD 2,430 ft. (New pay in unnamed field in Chittim area.)

Zavala County: Sutton Production Co. 2 Stuart, Section 9, GC&SF Sur., A-835. IP 860 M.c.f. daily, absolute open-flow potential, dry gas, shut-in. pressure 1,036 psi., perforations 2,525-40 ft. (San Miguel). TD 2,558 ft. (New field—Picosa Creek.)

WEST CENTRAL TEXAS

Shackelford County: Callihan Interests 1 Morrisett, 60-14-T&P, 2 mi. E Hamby. IP 94 BOPD, 14/64-in., 44-gravity, GOR 450, Palo Pinto 3,256-61 ft. TD 3,339 ft.

West Central Drilling Co. 1-A Baker, Wm. Watson Sur., A-763, 5 mi. S Leuders. IPP 86 BOPD, 39-gravity, GOR 150, Bluff Creek 1,671-77. TD 2,122 ft.

Throckmorton County: Bennett Well Service 1 Swensen 175, Sec. 175, BBB&C Sur., 9 mi. NW Throckmorton. IP 328 BOPD, 18/64-in., 40-gravity, GOR 500, TP 310 psi., Strawn sand 4,230 ft. TD 4,236 ft.

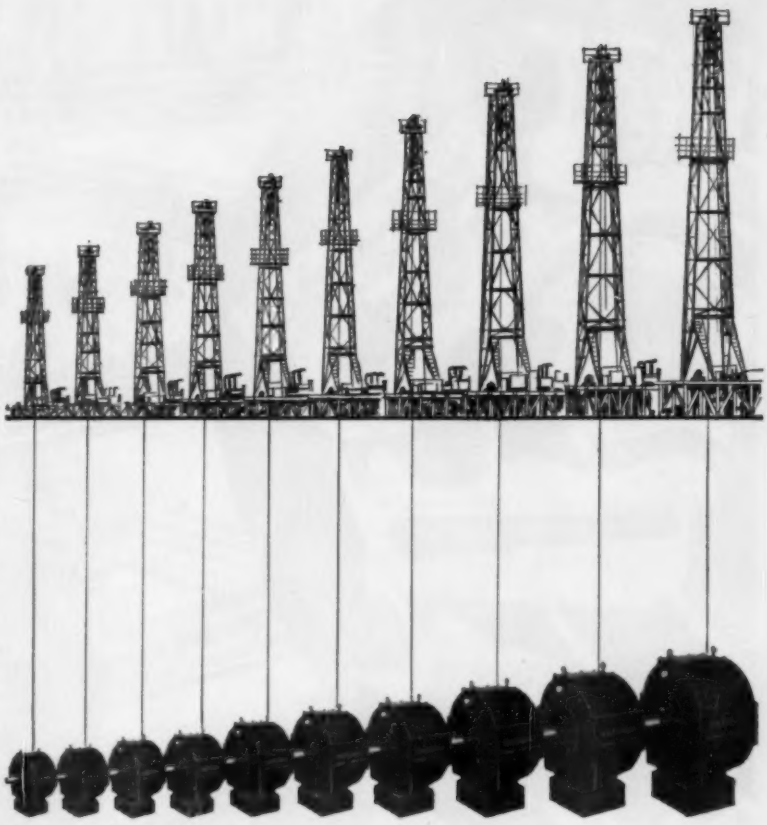
WEST TEXAS

Andrews County: Magnolia Petroleum Co. 1 Fasken "BB," 26-40-T2N-T&P Sur., Ellenburger discovery in Lowe (Silurian) field. Dual completion. Ellenburger IP, pumped 16 bbl. 45-gravity oil, GOR 528, 13,314-35 ft., regular pay 12,800-15, 12,823-32 ft., IP 120 BOPD, 30/64-in., 45-gravity, GOR 630, TP 75 psi. TD 13,342 ft.

Upton County: Sinclair Oil & Gas Co. 1 Ella Corbett estate, 23-B2-GC&SF, 6½ mi. SW Rankin. IP 191.7 BOPD, ½-in., 43-gravity, GOR 225, TP 75 psi., Ellenburger 10,502-10 ft. TD 10,550 ft.

SOUTHEAST NEW MEXICO

Lea County: R. C. Lipscomb 1 H. W. Harris, 2-13s-38e. IP 216 BOPD, ¼-in., 42-gravity, TP 355 psi., Wolfcamp 9,047-64, 9,072-90 ft., TD 11,918 ft., PB 9,465 ft. Elev. 3,809 ft.



National's family of torque converters takes care of oil field needs from 100 to 1000 HP

National Torque Converters have handled so many BIG jobs well that a lot of oil field men don't realize that units are available to handle *small* jobs, too.

The National line includes six sizes, classified according to the diameter of the hydraulic circuit. But this doesn't tell the real story of availability. The line also includes seventeen hydraulic circuits, which permit the converter to be accurately matched to the power and speed characteristics of the engine. This is a major reason for the high efficiency, top performance and enduring reliability that users report.

For new applications of from 100 to 1000 HP you can order National Torque Converters in selected sizes and circuits. You can order the converters "packaged" with the engines of most of the nation's leading engine builders. And as original equipment, you can specify National Torque Converters on Bethlehem, Brewster, Cardwell, Continental-Emsco, Ideco, Joy, National Supply, "Oilwell," Unit Rig or Wilson drilling rigs. For more information . . . write:

THE NATIONAL SUPPLY COMPANY

INDUSTRIAL PRODUCTS DIVISION

Two Gateway Center, Pittsburgh 22, Pa.

Pace-setters in the progress of industrial power transmission

The "PACKAGED UNIT" for PEAK PERFORMANCE

There's no puzzle to meeting the exacting demands of rough, off-the-road construction work when you depend on Leland's famous "Packaged Unit" for dependable service — trouble-free operation.

Headache Rack — for absolute safety to operator. Heavy duty hydraulic tubing frame, mounts spare wheel.

Winch Mounting Brackets — for strength, safety and adaptability to **all** winching jobs — with famous Tulsa Winches, if requested.

Gin Pole Pocket Settings — for double or single gin-pole use, bearing housings for rolling tailpipe, recessed in one-piece steel castings with gin poles.

Rolling Tail Pipe — seamless hydraulic tubing, mounted on shielded ball bearings, in special castings.

Flush Mounted Body Deck Plate — 2" hardwood flush mounted with steel — recessed snatchblock toggle, pole trailer bolster hole in tailboard.

Before you equip for your next job, you owe it to your pocketbook to see a Leland representative.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

OKLAHOMA

Love County: The Texas Co. 2 Lena B. Green, C NE SW NE 18-7s-3e. IPF 342 BOPD, 38°-gravity. Sycamore 2,606-96 ft. TD 2,870 ft. New pay discovery in southwest Enville pool.

McClain County: Cooperative Refinery Association 1 Walker "B," NW 18-7n-2w. IPF 350 BOPD, Tulip Creek sand 8,723-27 ft., Bromide 8,411-16 ft. 39° and 40° gravity, respectively TD 9,385 ft.

Cleveland County: T. P. Petroleum 1 McDaniel, SE SE SW 5-9n-2w. IPF 788 BOPD, Prue sand 6,656-76 ft., Viola 7,195-7,218 ft. 37.5° gravity. TD 7,218 ft. New pay (Viola) in northeast Norman pool.

Sequoyah County: Carter Oil Co. 1 Roy H. Wiliams, C NW SE 5-10n-24e. IP 2,853 M.c.f. of gas per day, Cromwell 2,988-3,040 ft. TD 4,202 ft.

Lincoln County: Albert Brauer 1 Humphrey, SW SW SW 2-13n-3e. IPF 17,000 M.c.f. of gas per day, 8 bbl. distillate. Cleveland sand 3,469-3,502 ft. TD 4,195 ft. New pay in East Happy Hill pool.

Wico Oil Co. 1 Sontag, C W½ NW NW 28-13n-6e. IP 1,880 M.c.f. of gas per day, Dutcher 3,790-94 ft. TD 4,451 ft.

A. W. Cherry 1 Jones, NW SW SW 33-17n-3e. IPF 12,420 M.c.f. of gas per day, 8 bbl. distillate, Skinner sand 4,075-78 ft. TD 4,292 ft.

Woodward County: Sinclair Oil & Gas Co. 1 R. F. Gilbert, C SE NW 1-23n-20w. IP 3,500 M.c.f. of gas per day, Morrow 7,523-38 ft., 7,567-71 ft. TD 7,845 ft. New field.

Osage County: Oliphant 1 Bigheart, SW NE SE 8-23n-4e. IPP 16.6 BOPD, Miss. 3,536-66 ft. 38° gravity. TD 4,062 ft.

Grant County: R. V. Poter-Apache Oil Co. 1-A Jones estate, SE SE SE 4-26n-6w. IPF 360 BOPD, Cherokee sand 5,044-48 ft., 5,054-77 ft., 39° gravity. TD 5,215 ft.

Alfalfa County: Gulf Oil Corp. 1 Stover, SE SE 16-27n-9w. IPF 160 BOPD, Cherokee 5,234-63 ft., 30.2° gravity. TD 5,335 ft.

KANSAS

Graham County: Empire Drilling and H. W. Shields 1 Reidel SE SE NW 9-10s-25w. IPP 265 BOPD, 35° gravity. Lansing 4,015-21 ft. TD 4,050 ft. Opens Northwest Elrick pool.

Empire Drilling Co. and NCRA 1 Dinkel "B," NE NE SW 10-10s-25w. IPP 331 BOPD, 34° gravity, Lansing 3,984-4,010½ ft. TD 4,010½ ft. Extension Northeast Elrick pool.

Pawnee County: O. A. Sutton 1 Wagoner, SE SE NW 17-20s-20w. IPP 95 BOPD, 20 per cent water, 42° gravity. Miss. chat 4,325-28 ft. TD 4,620 ft. Opens Brown's Grove pool.

Stafford County: W. J. Coppinger 1 Bransing, NW NW NE 17-24s-12w. IPP 139 BOPD, 11 per cent water, 40° gravity. Viola 3,873-77 ft. TD 3,877 ft. Opens Knoche pool.

Stanton County: William Gruenerwald 1 Tucker, C SE 29-30s-41w. IP 1,001 M.c.f. of gas per day, Morrow 5,152-62 ft. TD 5,400 ft. New field.

Meade County: Skelly Oil Co. 1 P. O. Mohler, SW SW SW 35-33s-29w. IPP 320 BOPD, 42° gravity. Marmaton 5,259-67 ft. TD 5,906 ft. New pool.

Cowley County: Wrico Drilling Co. 1 Crane, NW SW SW 7-33s-4e. IPP 18 BOPD, 10 BW, 36° gravity, Miss. chat 3,250-60 ft. TD 3,300 ft. Opens Crane pool.

ARKANSAS

Franklin County: Athletic Mining & Smelting Co. et al 1 Harry Robberson, C

LONG TIME BETWEEN CHANGES!

When You START Using Guiberson's

Type U Wire Line Oil Saver

Workover crews tell us they keep fewer spare rubbers on the rig for this saver — they need changing so seldom.

Swabbing operations go along a lot smoother with less trouble and less expense. Three durable special alloy bronze *rollers* center the wire line perfectly through the saver. And the rubbers in this saver are the same large, long-wearing rubbers used in Guiberson's Type S oil saver — they won't extrude or stick in the housing. Split-type housing, joined by two husky bolts, makes installation or removal quick and easy.

Use the Type U singly, or in tandem leaving off the roller cap on the lower saver. When you do need them, get Guiberson replacement rubbers packed two pair to a blue and yellow box.

Get the Best — Get Guiberson.

Available in 2" or 2½" EUE 8 round double pin sizes and 3" 8V line pipe or 3" EUE 8 round double pin sizes for ⅜"-7/16", ½"-⅝" or ¾"-1" wire line.

SAVE THAT SOMEONE GETTER BE GUIBERSON

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere

NW NW NE 13-8n-27w. IP 10,000 M.c.f. of gas per day, Barton sand 5,118-66 ft. TD 6,301 ft. New pay in Aetna gas field.

COLORADO

Garfield County: National Associated Petroleum Co. 1-A Federal, 22-7s-104w. SE SE SW. IP 2,714 M.c.f. of gas per day, Buckhorn 4,113-27 ft. TD 4,193 ft. New pool.

Kerr-McGee Oil Industries, Inc. 1 Columbine-Government, 9-8s-102w. IP 1,600 M.c.f. of gas per day. Buckhorn 3,182-96 ft., Dakota 3,084-3,106 ft. Extension.

Rio Blanco County: Phillips Petroleum Co. 1 Mannel, 27-1n-95w. IP 7,800 M.c.f. of gas per day, Fort Union 4,043-63 ft. TD 17,033 ft. Discovery and Colorado's deepest hole.

Weld County: Stuarco 1 Biggs, C NW SW 23-7n-58w. IPF 432 BOPD "D" sand 6,344-52 ft. TD 6,461 ft. New pool.

EASTERN NEBRASKA

Red Willow County: Plains Exploration and Mast Driling Co. 1 Pore, NW NW NW 29-2n-29w. IPP 50 BOPD, Lansing 3,640-44 ft. 30° gravity. TD 4,102 ft. New pool on Cambridge arch.

ILLINOIS

Saline County: R-K Petroleum Co. 1 McConnell, NE NE NE 29-8s-6e. IPP 76 BOPD, 25 BW, Aux Vases 2,848-58 ft. TD 3,030 ft. Extension to South Raleigh pool.

INDIANA

Posey County: Rush Creek 1 W. J. Witte Kindt, NE NE SE 26-5s-13w. IPP 90 BOPD, Mansfield 1,278-86 ft. TD 2,038 ft. Opens North Oliver pool.

C. E. O'Neil 1 Kiltz, NE SE NE 17-6s-13w. IPP 48 BOPD, Penn. 1,306-28 ft. TD 2,973 ft. Extension to West Bufkin pool.

Spencer County: H. C. Farmer 1 Doyle, SE NE SE 29-6s-5w. IPP 20 BOPD, Cypress 892-96 ft. TD 898 ft. Extension to Grandview pool.

KENTUCKY

Christian County: Russell McIntosh 1 Gordan Boyd, 9-F-25. IP 8 BOPD, Benoist 524-35 ft. TD 535 ft. Extension to Kelly pool.

Henderson County: Slagter Production Co. 1 Sites, 4-O-25. IPP 49 BOPD, 36 BW, McClosky 2,412-20 ft., 2,513-17 ft. TD 2,533 ft. New pool.

MONTANA

Hill County: Empire State 1 Aronow, NW NW NE 7-33n-11e. IP 10,000 M.c.f. of gas per day, Sawtooth 3,486-3,501 ft. TD 3,700 ft. New gas pool.

NEBRASKA

Morrill County: Skelly Oil Co. 1 Lindberg "F," C NE SE 2-18n-52w. IPF 23 BOPD, 12 BW, "J" sand 4,632-35 ft. TD 4,720 ft. New pool.

NORTH DAKOTA

McKenzie County: The Texas Co. 1 C. Kerr, C SW SW 5-150n-96w. IPF 88 BOPD, 15 BW, 41.1° gravity. Madison 9,396-9,430 ft., 9,440-56 ft. TD 9,608 ft.

Bottineau County: Amerada Petroleum Corp. 1 L. D. Henry, C NW SE 16-161n-79w. IPF 121 BOPD, 36.9° gravity, Spearfish 3,363-80 ft., Charles 3,389-3,406 ft. TD 3,665 ft. New pool.

Divide County: Sparton Oil Co. 1 Ecklund, C SW NW 9-162n-95w. IPF 90 BOPD, 16 BW, 34.5° gravity, Midale 6,739-43 ft. TD 6,854 ft.

Burke County: Arrowhead Exploration Co. 1 Probst, C SE SE 17-163n-92w. IPF 211 BOPD, 39.9° gravity, Midale 6,067-70 ft., Nesson 6,080-82 ft. TD 6,425 ft.

WEST VIRGINIA

Preston County, Reno district: Hope Natural Gas Co. 10096 Florence M. Auvil, elev. 2,028 ft., 7,900,000 cu. ft. gas after frac. chert 4,570 ft., gas 4,619 ft., Oriskany sand 4,722 ft., gas 4,744 ft. Helderberg 4,834 ft., gas 4,927 ft. TD 4,984 ft.

WYOMING

Big Horn County: Empire State 1 Government, 15-55n-96w. IPP 55 BOPD, 22 BW, 23° gravity, Phosphoria 6,770-6,807 ft. TD 8,046 ft. New pool.

Fremont County: Gulf Oil Corp. 1 Trail Ridge-Federal, C SW NW 9-27n-95w. IP 861 M.c.f. of gas per day, Dakota 1,426-40 ft. TD 3,990 ft.

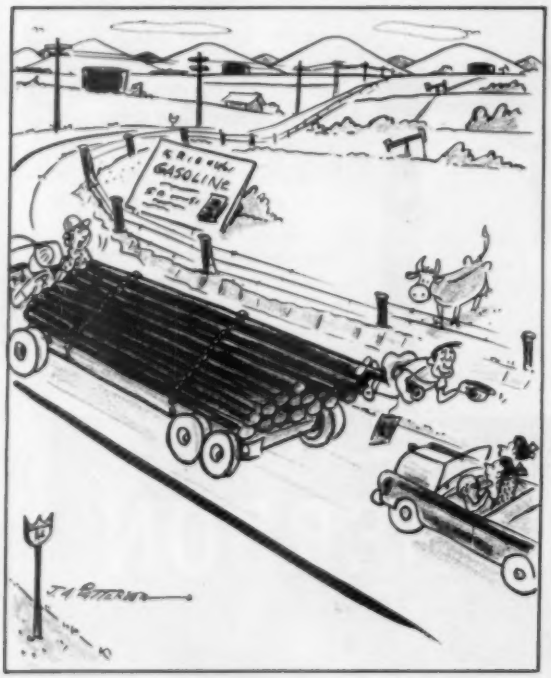
Skelly Oil Co. 3 Indian "B," 22-3n-1w. IPP 96 BOPD. 9 BW, Crow Mountain 4,826-36 ft. TD 4,865 ft. New pay in Pilot Butte poll.

Shannon Oil Co. 4 Unit, C SW SW 17-33n-94w. IP 5,500 M.c.f. of gas per day, Dakota 1,285-95 ft., Lakota 1,350-70 ft., 1,390-1,405 ft. TD 3,092 ft. New pool.

UTAH

Uintah County: Havenstrite Ute Trails Unit, 2-10s-21e. IP 1,350 M.c.f. of gas per day, Wasatch 5,428-56 ft., 5,366-74 ft., Green River 3,384-92 ft. TD 6,475 ft.

Havenstrite 11-X-21n Ute Trail Unit, 21-10s-22e. IP 2,640 M.c.f. of gas per day, Wasatch 5,052-78 ft. TD 5,318 ft.



"Worst flirt I ever knew."

ALL-NEW D&S TRI-DIA BIT!

faster penetration, more rig savings

Designed for safety

Reduced O D wall contact approaches that of Tri-Cone Rock Bit.

Eliminates swabbing, hydraulic action when making trip.

Permits washing out large junk iron pieces, minimizing that hazard.

Readily washes out cavings to bottom.

Reduces mud wall cake sticking hazard.

Largest measurable diameter materially less than diameter of hole it will cut. (Special Bit Breaker required.)

Drilling & Service INC. | DIAMOND DRILLING EQUIPMENT
6210 NORTH CENTRAL EXPRESSWAY | DALLAS, TEXAS
OFFICES IN ALL PRINCIPAL OIL AREAS

KEEP PURE DRINKING WATER ALWAYS HANDY

insist on the highest quality

Gotkool

water cans and coolers

Specify **"GOTKOOL"** the next time you order water cans or coolers. **"GOTKOOL'S"** exclusive construction keeps water cooler . . . fresher . . . purer. Extra wide, snug-fitting, splash-proof top keeps out impurities. Non-leaking, push-button faucets, either extended or recessed flush-mounted. *Buy* **"GOTKOOL"** *at your supply store today.*

GOTKOOL Water Cooler – made in 1½-, 2-, 3-, 5-, 10-, 15-, and 20-gallon sizes with either extended or recessed, flush-mounted faucet. *Note:* 15- and 20-gallon sizes available with extended faucet only.

GOTKOOL Water Can – made in 1½-, 2-, 3-, 5-, 10-, 15-, and 20-gallon sizes without faucet.

Insist on the genuine – look for the *Blue and Black* Label with the name "GOTKOOL" in Red.

H. P. GOTT MFG. CO.

WINFIELD, KANSAS

AS A SERVICE TO OUR READERS

The Oil and Gas Journal prepares in booklet form, many of the more popular series which appear in our own Journal. These booklets are bound in attractive heavy paper covers for your personal reference library. Check the list below. Each of these technical reprint manuals costs only $1.

- Drlg. Engr. Reference Manual
- Corrosion and Its Control
- Engr. Fund. in Modern Drlg.
- Oil Well Pumping Methods
- Hydraulic Fracturing
- H_2S Extraction—Sulfur Mfg.
- Secondary Recovery
- Water Flooding—Theory and Practice
- Water Flooding—Design and Operation
- Heat Transfer
- Heat Transfer Calculations
- Process Foreman's Manual
- Cat Cracker Operation
- Instrumentation
- Pumps, Fans, and Blowers
- Pipeliner's Notebook
- Fluid Flow Formulas
- Pipeline Hydraulics
- New Refiners Notebook
- Fractionation and Absorpt.

MARK YOUR CHOICE – CLIP THIS AD

SEND WITH YOUR PAYMENT, NAME AND ADDRESS

THE OIL AND GAS JOURNAL

READERS SERVICE DEPARTMENT

P. O. BOX 1260 TULSA, OKLA.

TOUGH FINANCING PROBLEMS?

rely on

REPUBLIC National BANK of Dallas

Here, at one of the pioneer oil banks of the Southwest, the toughest problem in production financing receives the expert, thorough counsel and guidance which has made Republic National Bank of Dallas a world leader in petroleum financing.

In capital structure and total resources . . . in the size and scope of the South's largest Oil Department . . . Republic offers added strength you can *bank* on!

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

CAPITAL & SURPLUS • LARGEST IN THE SOUTH

D. W. FARNHAM

Pan Am Names Foreign Chief

. . . to supervise drilling and production on concessions in Latin America. New assignment goes to D. W. Farnham as company gears for big push overseas.

WITH ONE RIG READY to start a new wildcat in Cuba and several tests already under way in Venezuela, Pan American Petroleum Corp.'s new foreign operating superintendent is helping to lay groundwork for a busy year abroad.

"Dusty" Farnham, assigned to the newly created post earlier this fall, has just returned to his home base in Tulsa after a 2-week tour of Pan Am's budding operations in Latin America.

He takes over his new job just as the Standard Oil Co. (Ind.) producing subsidiary gets into high gear in a new program to find and develop reserves outside the U. S. and Canada—the first such program for the Indiana Standard family in more than 25 years.

Involved in the program are 16,000,000 acres in Cuba, both on and offshore, and several big blocks in Lake Maracaibo, the Gulf of Paria, the Apure basin, and southern Monagas, acquired in Venezuela in 1957.

South American experience . . . Farnham is no newcomer to the Indiana Standard family and South America. He comes to Pan Am from another Indiana subsidiary, Amoco Chemicals Corp. With Amoco he was synthesis superintendent at the gas-synthesis plant at Brownsville, Tex.

His oil-industry career began when he graduated from the Naval Academy at Annapolis in 1930 and took a job as a student engineer with Standard Oil Co. (N. J.).

After a brief stint with two Jersey subsidiaries in Oklahoma, he moved to El Centro, Colombia, with another Jersey subsidiary, Tropical Oil Co., where he put his engineering training to use as gasoline-plant operator, field engineer, and finally assistant superintendent of Tropical's gas department.

In 1937 he returned to the U. S. to work on his master's degree in mechanical engineering at California Institute of Technology.

A year later he was back in South America—this time with another Jersey subsidiary, International Petroleum Co., Ltd., in Negritos, Peru. For 3 years he worked in gasoline-plant construction and production engineering.

But the war interrupted his career, and when he returned to civilian life in 1945, he joined Pan American when the company was still known as Stanolind Oil & Gas Co. in Tulsa. During the next 8 years he was gas engineer, assistant to the chief plant engineer, and finally Fort Worth division gas superintendent in 1952. He held this post until 1954 when he moved to Amoco Chemical at Brownsville.

Navy skipper . . . Farnham's last duty in South America ended in 1941 while he was home on leave from International Petroleum in Peru.

The war broke out and his early training at Annapolis was polished up for 4 years of naval duty in both theaters of war—as skipper of several destroyer escorts and as engineer officer abroad the heavy cruiser Louisville.

He and his wife Margot, whom he met in South America, have three sons—one in grade school, another in high school, and the eldest, a mechanical engineering student at Texas Technological College.

The year ahead . . . Pan Am has no production yet on its concessions in Latin America. But drilling is under way on several fronts.

The company's Cuban subsidiary, Cuban Stanolind Oil Co., was rigging up rotary last week at a proposed 9,000-ft. test at Tortuga Shoal about 20 miles off the coast of South Central Cuba. The test is about 60 miles southwest of inland production at Jatibonico.

Three tests are drilling on concessions owned wholly or partially by Pan Venezuelan Oil Co., a Pan Am subsidiary. These include a 12,000-ft. wildcat on Block 12 in Lake Maracaibo, owned one-third by Pan Ven and operated by Sun Oil Co., and two tests on Blocks 11 and 30 in southern Monagas, both operated by Pan Ven.

William F. Smith has been transferred by Ohio Oil Co. from the Wichita geological staff to the Ardmore, Okla., district office.

S. A. Berthiaume has been advanced by The Texas Co. from assistant to the vice president in charge of the domestic producing department to vice president and general manager of Texaco Exploration Co., a Canadian subsidiary. He will headquarter in Calgary. A graduate of the University of Washington and Cornell University, Berthiaume joined Texaco in 1940.

Personals

C. E. SPAHR

Charles E. Spahr, executive vice president of Standard Oil Co. (Ohio) since 1955, has moved up to president. He succeeds **Clyde T. Foster,** who will continue as chairman of the board and chief executive officer. Foster had been president since 1949. Spahr joined the company in 1939. During World War II Spahr supervised construction of one of the major pipelines in the India-Burma theater of operations. Returning to Sohio, he became vice president for transportation in 1951, and later assistant to the president. In 1952 he was director of the supply and transportation division of the Petroleum Administration for Defense. He became a Sohio director 2 years ago.

E. A. Galvin has been named president of New Gas Exploration Co., Calgary. **W. S. Gray** has been appointed vice president, with **J. K. Fletcher** as secretary-treasurer. The appointments follow purchase of controlling interest in New Gas by Medallion Petroleums.

J. C. Alspaugh has been named assistant superintendent of the butadiene plant at Humble Oil & Refining Co.'s Baytown, Tex., refinery. **T. C. Smith** has been appointed foreman of the utilities department there and **J. D. Robertson** will be assistant foreman of the compound and package department.

R. L. Warden, Shell Oil Co.'s Odessa, Tex., district exploitation engineer, has been appointed reservoir engineer in Midland, Tex. **R. E. Strom,** junior mechanical engineer in Houston, has been promoted to mechanical engineer and transferred to Hobbs, N. M. Also promoted to mechanical engineer is **R. I. Thomas,** junior mechanical engineer in Houston, who will headquarter in Odessa.

T. J. Greaney and **G. W. Wilson** have been promoted to assistant division heads in the technical service division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. Greaney will be in charge of economic analysis, catalytic cracking, catalytic light ends, and aviation sections of the division. Wilson will be responsible for the lubricating oil, distillate finishing, and distillation and utilities sections. Both Greaney and Wilson are graduates of Rice Institute.

Robert J. Fanning has been named senior research engineer in Continental Oil Co.'s development and research department.

George K. Simpson, formerly with Esso Standard Oil Co., has joined Standard Oil Co. (Ind.) at the company's Whiting, Ind., research laboratories.

John Clutter, Jack Shaughnessy, and **John Pardee,** geologists for El Paso Natural Gas Co., and **Bob Roth,** scout, have been transferred from Salt Lake City to the company's new Grand Junction, Colo., office.

Ross Walker, manager of the Mississippi coast district of United Gas Corp., Gulfport, Miss., has been promoted to assistant manager of the Beaumont, Tex., division. He succeeds **John C. Dezelle,** who was recently promoted to assistant operating manager in the Texas distribution division in Houston.

A. L. Bishop has been appointed assistant superintendent of The Texas Co.'s Puget Sound refinery, now under construction near Anacortes, Wash. Bishop was formerly supervisor of the pressure-still area at Texaco's Los Angeles refinery. He has been with the company since 1937.

CARL H. YOUNG

Carl H. Young, formerly tool pusher, has been named assistant to the vice president in charge of drilling operations for Helmerich & Payne, Inc. Young joined Helmerich & Payne in 1937 as a roughneck. In his new assignment he will assist in direction and coordination of field operations. He has transferred headquarters to Tulsa from McCamey, Tex.

Earl F. Wakefield, Wakefield Drilling Co., Wichita, has been elected president of Kansas Independent Oil and Gas Association. He succeeds **T. H. Allan,** Wichita. Newly elected area vice presidents are **Glenn Dunne,** Wichita; **C. O. Chubb,** Great Bend; and **D. G. Hansen,** Logan. New directors of the association are Hansen; Chubb; **J. D. McKay,** El Dorado; **Mark Adams,** Wichita; **Lynn Trombla,** Wichita; **Jim Adkins,** Great Bend; **Theodore Gore,** Wichita; **A. S. Ritchie,** Wichita; **A. L. Derby, Jr.,** Wichita; **George Bruce,** Wichita; **Lester Wilkonson,** Wichita; **Walter Kuhn,** Wichita; and **Ross Beach,** Hays.

E. J. DEU PREE

E. J. Deu Pree, The California Co.'s assistant manager of production, has been promoted to vice president and general manager of production. He succeeds **T. B. Flood,** who will retire January 1. Flood, also a director of the company, has been with Calco since 1920. Deu Pree joined the company in 1929. He had been assistant general manager of the production department since 1950 and was manager of operations for the department and southern division operating superintendent before that time.

E. J. Ledet, Jr., gas engineer with Magnolia Petroleum Co., has been transferred to Pampa, Tex., from Vanderbilt, Tex.

S. O. Cooper, foreman for Barnhart Hydrocarbon Corp. at Big Lake, Tex., has joined Continental Carbon Co. as treater plant foreman at Eunice, N. M.

Frank M. Jacobson has been named vice president, general manager, and a director of Murphy-Canada Oil Co., subsidiary of Murphy Corp. He will headquarter in Calgary. Jacobson was president of Lucerne Corp., Dallas production company, until its sale in 1956.

Kenneth W. Germond has been assigned to the new Calgary division office of Union Oil & Gas Corp. of Louisiana as division manager of exploration. **Troy C. Simpson** has been named division production superintendent in Calgary with **H. P. Evans** as division landman. **Herman A. Engel, Jr.,** was named division manager and head of Canadian operations last month.

Reburn B. Casey, assistant superintendent at Lone Star Gas Co.'s Abilene, Tex., compressor station, has been promoted to superintendent. He succeeds the late A. N. Ridings. Casey will also supervise compressor station operations at Lone Star's View field gas-storage project southwest of Abilene. At the company's Waco, Tex., compressor station, **G. V. O'Gorman** has been named superintendent. He was formerly assistant superintendent at the Shamrock, Tex., compressor station.

Personals

DR. HEINEMANN

Dr. Heinz Heinemann, formerly with Houdry Process Corp., has joined M. W. Kellogg Co.'s research department staff to assist in planning technical coordination and long range research. He will be associated with **Dr. Alex G. Oblad,** Kellogg vice president in charge of research and development. Heinemann is currently president of the International Congress on Catalysis.

Don L. Raffety, formerly Oklahoma City district manager for Globe Oil & Refining Co., has joined Dudley & Heath Drilling Co., Stillwater, Okla., as manager of exploration.

L. C. Poindexter, general pipeline superintendent for United Gas Pipe Line Co.'s eastern division and a director of the company, has been named chief engineer. **C. W. Hollenshead,** assistant to the eastern division superintendent of pipeline operations, moves up to superintendent, replacing Poindexter. Poindexter had been eastern division superintendent and a director of United Gas since 1940.

C. R. Turvey, superintendent of catalytic cracking at Continental Oil Co.'s Ponca City, Okla., refinery, has been transferred to Houston as assistant director of the new-products division. **D. E. Huth,** thermal-cracking superintendent at Ponca City, has been named superintendent of catalytic cracking succeeding Turvey. **L. S. Burke,** superintendent of lubricating oils, becomes superintendent of thermal cracking at Ponca City.

G. H. Short, manager of Phillips Petroleum Co.'s plant near Borger, Tex., has been named manager of the Plains butadiene plant, Borger. The Plains facility has recently been expanded and synthetic rubber capacity increased 88 per cent to 108,000 long tons annually. In the future the Plains facilities will be operated as two separate plants, one for butadiene and one for copolymer. **C. W. Forman,** superintendent of the company's Cactus ammonia plant near Dumas, Tex., has been transferred to Borger as manager of the Plains copolymer plant. **H. D. Trotter,** assistant superintendent of the Plains plant, has been named manager of the plant at Dumas.

R. B. Ross, formerly with Pan American Petroleum Corp. in Casper, Wyo., has joined McElroy Ranch Co. as Denver division geologist.

Philip Pezzaglia has been named supervisor in the chemical reaction process department at Shell Development Co.'s Emeryville, Calif., research center.

S. A. (Sam) Patterson has been elected vice president and general manager of Bankline Oil Co. in Los Angeles. Patterson was formerly assistant to the president, **L. L. Aubert.**

Elmer Savage, superintendent in Great Bend, Kans., for Kenwood Oil Co. and Schermerhorn Oil Corp., has been transferred to Albert, Kans., in the same capacity.

Henry H. Neel, manager of foreign exploration for Tidewater Oil Co., has been promoted to exploration manager of the company. He will be responsible for coordinating both foreign and domestic exploration programs. Neel was western division exploration manager before becoming foreign exploration head earlier this year. A graduate of Stanford University, he joined Tidewater in 1942.

J. C. WEAVER, JR.

Joseph C. Weaver, Jr., technical director of Amoco Chemicals Corp.'s Brownsville, Tex., plant, which recently closed, has been named associate director of American Oil Co.'s research and development department. Weaver has been with subsidiaries of Standard Oil Co. (Ind.) since 1947 when he joined Pan American Petroleum Corp. (then Stanolind Oil & Gas Co.) as a chemical engineer.

A. L. Crain, formerly with Phillips Petroleum Co., has joined Monterey Oil Co. at Midland, Tex., as district engineer.

W. T. Wheeler, Jr., production engineer with Continental Co. in Eunice, N. M., has joined El Paso Natural Gas Co. in Midland, Tex., as petroleum engineer.

W. W. White, vice president of Esso Research & Engineering Co., has been elected a director of Esso Export Corp. White joined Esso Standard Oil Co. in 1930.

DEATHS

W. H. Stueve, 72, pipeline consultant and retired chief power consultant and industrial development representative for Oklahoma Gas & Electric Co., died December 8 in Oklahoma City. During World War II, Stueve was chief electrical engineer for the Big and Little Big Inch pipeline system. In 1947 he was consultant to Texas Eastern Transmission Corp. on the economic study and installation of electrically driven centrifugal compressors which replaced oil pumps in the conversion of the Inch lines from products to gas. This was the first use of centrifugal compressors for natural-gas transmission. Since his retirement from OG&E, Steuve had been an engineering consultant specializing in pipeline pumping stations, transmission lines, and substations.

C. A. Richey, 48, Mount Vernon, Ill., oil operator and drilling contractor, died recently in Owensboro, Ky.

Henry C. Cortes, 65, vice president and a director of Magnolia Petroleum Co., died December 6 of a heart attack in Honolulu while en route to Formosa to visit a daughter. He was to have retired from active service with Magnolia January 1. Cortes was the Magnolia executive in charge of the firm's big field research laboratory at Dallas and also acted as chief coordinator of the company's offshore operations. He had been with Magnolia and related firms since 1924. He was recognized internationally for his work on offshore oil exploration and in the field of fundamental and applied research.

Weldon Phillips, 32, representative of Magnet Cove Barium Corp. (Magcobar), was killed recently when his car struck a highway abutment near Bondad, Colo. Phillips headquartered in Farmington, N. M.

Williams A. Haskell, 89, Pleasantville, Pa., oil producer, died September 3 in Pleasantville. Haskell was active in the oil business in his area for 70 years, beginning in 1887.

Hugh L. (Pert) Sargent, 39, vice president, oil-tool sales, for Sargent Engineering Corp., died recently in Pittsburgh.

Season's Greetings

Again it is our pleasure to send
you our best wishes for the New Year.
May happiness, contentment, and the
best of everything be yours.

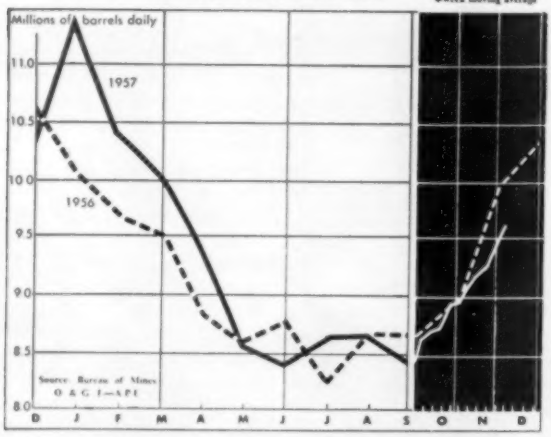
NATIONAL BANK OF TULSA
THE OIL BANK OF AMERICA
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,848,975	UP	14,395	DOWN	508,678
Crude stocks	279,752,000	DOWN	3,414,000	UP	4,472,000
Completions	906	UP	7	DOWN	119
Refinery runs	7,807,000	NO CHANGE		DOWN	58,000
Gasoline stocks	188,087,000	UP	2,884,000	UP	12,660,000
Kerosine stocks	31,283,000	DOWN	1,378,000	DOWN	1,828,000
Distillate stocks	163,145,000	DOWN	4,449,000	UP	17,595,000
Residual stocks	58,839,000	UP	32,000	UP	15,064,000
Four-product stocks	441,354,000	DOWN	2,911,000	UP	43,491,000
Total imports	1,563,200	UP	217,600	DOWN	121,200

TOTAL DEMAND—ALL OILS



Cool Weather Helps Distillate Sales But Gasoline Markets Are Softer

PETROLEUM MARKETS are reflecting changes in the weather, but in many areas surplus inventories are limiting these changes to minor adjustments.

On the Gulf Coast, light-fuel markets are showing some strength, but the evidence of strength is in the form of smaller discounts off postings. Up to about a week ago, there were reports of No. 2 fuel offered at 8.50 and 8.625 cents a gallon for cargo movement. Most of the spot suppliers are expecting to get 8.75 cents or more in the coming weeks.

However, some market analysts believe that it will take several weeks of good heating-oil weather on the East Coast to cut out all material moving below 9.0 cents from the Gulf Coast.

The slight firming of light-fuel markets on the East Coast has been due to colder weather. The general movement of distillate in the New York area indicated that some of the private-brand distributors had not filled their tanks as late as Thanksgiving. Unless these distributors filled storage within the past 2 weeks, they may have to pay a higher price for material purchased between now and the end of the year.

General market rumors in the New York area during Thanksgiving week were that some of these distributors were expecting a break in the distillate market. This forecast probably was based on the fact that weather in New York, measured in degree-days, had been warmer than last year and also warmer than normal.

The Weather Bureau's forecast for December called for above-normal temperatures in the New York area. This may have been an additional factor in the distributors' decision to hold back on distillate purchases.

Spot sales of distillate were reported to be rare at the end of the first week of December. The drop in sales was attributed to the disappearance of discounts off postings. Private-brand distributors probably will continue to gamble on the weather. So far, they have been on the winning side. The New York City weather through December 5 was about 6.5 per cent warmer than normal.

Until the cold wave moved through the central states last week, the Group 3 distillate market was softening slightly. Lower temperatures after December 10 added to sales and to the strength of the market.

Distillate stocks in District 2 are low enough to produce normal prices unless the weather is unusually warm.

Gasoline markets are weaker in most market areas. Tank-wagon and station prices have moved higher in New England, but the increases represented only corrections in extreme price-war areas.

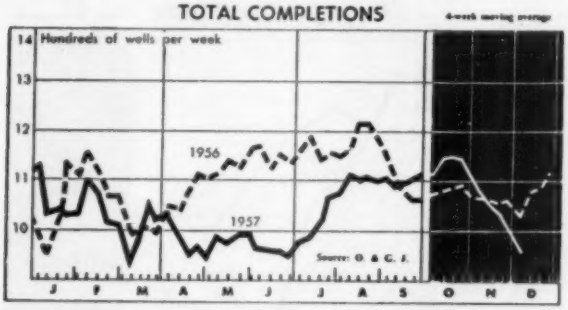
Cargo prices on the Gulf Coast seem to be sinking. Decreases in formal postings to levels nearer spot prices were followed by still lower spot offerings.

Some of the surplus gasoline from the Gulf Coast is finding its way up the Mississippi River into District 2. Regular gasoline of 90 octane is available on the Gulf Coast at prices about 1.0 cent a gallon under normal quotations on the Group 3 market.

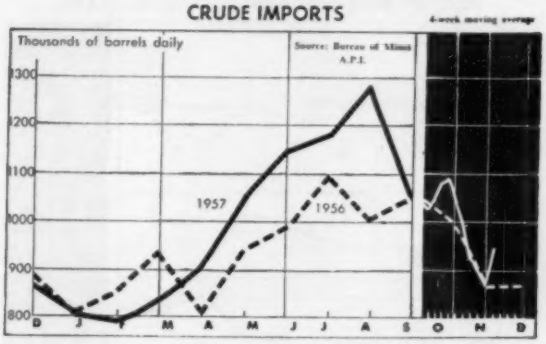
Natural-gasoline prices settled back to 4.5 cents on the Group 3 market and to 4.0 cents for North Texas.

Sohio Petroleum Co. reduced prices quoted for Illinois crude by 15 cents a barrel effective December 10. Ashland Oil & Refining Co. announced the same price effective December 13.

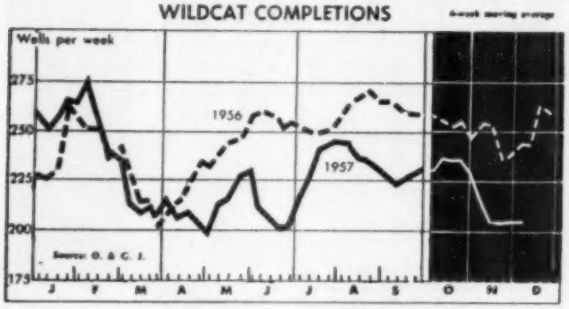
TOTAL COMPLETIONS



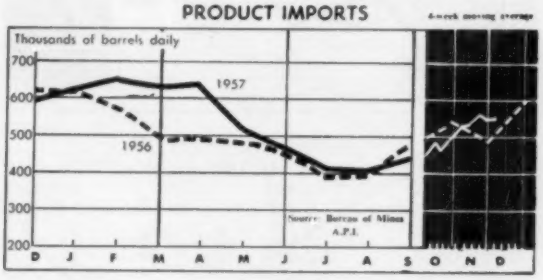
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

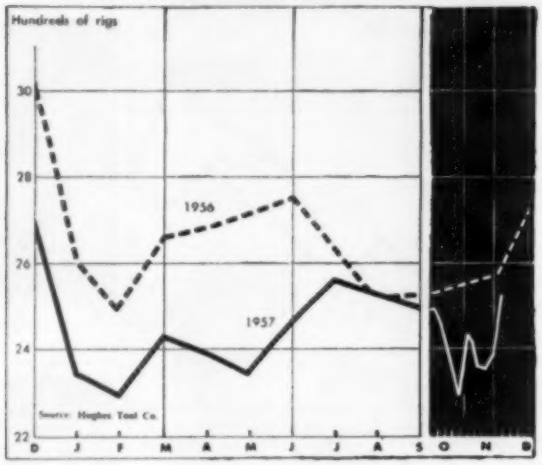


WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 7, 1957

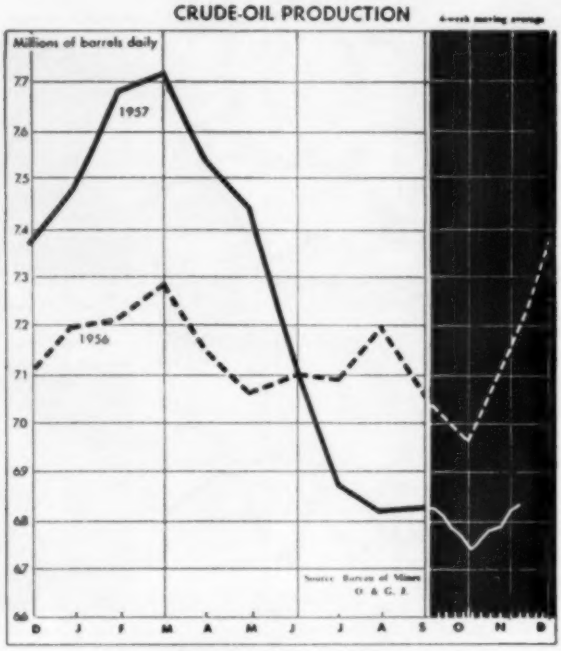
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	2	1	0	0	1	0	19,969	74	‡106	1	0	0	0	1	26	‡49
Arkansas	18	14	0	0	4	0	48,960	1,034	908	2	0	0	0	2	192	174
California	44	29	0	2	13	0	169,286	2,094	2,103	10	0	0	0	10	494	487
Colorado	15	2	0	0	13	0	85,328	800	1,147	10	0	0	0	10	518	627
Illinois	47	19	0	0	28	0	112,986	2,530	3,627	14	1	0	0	13	601	740
Indiana	17	7	0	0	10	0	26,638	653	674	2	0	0	0	2	123	133
Kansas	98	46	0	7	44	1	346,020	3,970	4,650	20	2	0	3	15	774	1,008
Kentucky	28	6	0	0	22	0	38,307	1,430	1,793	9	0	0	0	9	299	411
Louisiana	68	26	8	5	29	0	579,567	3,626	3,565	15	0	0	1	14	639	718
North	20	10	0	2	8	0	67,640	1,356	1,580	6	0	0	0	6	192	244
South	35	10	8	0	17	0	373,083	1,635	1,592	6	0	0	0	6	363	401
Offshore	13	6	0	3	4	0	138,844	635	393	3	0	0	1	2	84	73
Michigan	9	5	0	1	3	0	25,592	413	408	1	0	0	0	1	142	156
Mississippi	2	0	0	0	2	0	17,892	365	407	2	0	0	0	2	188	201
Montana	18	2	0	0	16	0	72,102	415	441	15	0	0	0	15	174	170
Nebraska	16	7	0	0	9	0	90,489	836	877	8	1	0	0	7	455	434
New Mexico	23	10	0	7	6	0	97,282	1,993	1,802	4	1	0	0	3	250	263
Northwest	11	1	0	7	3	0	36,364	849	801	1	0	0	0	1	96	98
Southeast	12	9	0	0	3	0	60,918	1,144	1,001	3	1	0	0	2	154	165
New York	12	4	0	2	1	5	19,133	440	.....	2	0	0	1	1	11	.....
North Dakota	8	2	0	0	6	0	48,259	281	253	6	1	0	0	5	126	74
Ohio	14	8	0	2	4	0	30,579	1,058	997	2	0	0	1	1	18	12
Oklahoma	114	59	1	2	42	10	371,723	5,879	7,654	8	2	0	1	5	697	814
Pennsylvania	0	0	0	0	0	0	0	571	†1,061	0	0	0	0	0	41	†36
Texas	316	176	7	10	123	0	1,414,943	20,091	20,338	70	4	1	2	63	4,722	5,275
District 1	27	13	1	3	10	0	78,930	1,168	*2,902	4	0	0	1	3	401	*1,022
District 2	10	6	0	2	2	0	64,348	725	*2,483	2	0	0	0	2	244	*821
District 3	20	9	2	0	9	0	113,872	1,544	.....	4	0	1	0	3	423	.....
District 4	39	8	3	0	28	0	213,404	1,314	.....	15	0	0	0	15	418	.....
East	21	10	0	1	10	0	113,024	1,267	1,067	4	0	0	0	4	355	401
District 7-B	39	18	0	0	21	0	112,608	2,737	.....	20	2	0	0	18	929	.....
West	92	73	0	1	18	0	492,721	5,703	5,382	13	2	0	1	10	807	854
District 9	47	25	0	1	21	0	132,742	4,318	*7,261	6	0	0	0	6	1,039	*2,059
District 10	21	14	1	2	4	0	93,294	1,315	1,243	2	0	0	0	2	106	118
Utah	3	1	0	0	2	0	16,313	234	133	2	0	0	0	2	119	72
West Virginia	21	1	0	13	7	0	60,133	656	655	1	0	0	0	1	31	25
Wyoming	12	8	0	0	4	0	49,182	810	855	5	1	0	0	4	283	260
Miscellaneous (S. D.)	1	0	0	0	1	0	3,151	125	71	1	0	0	0	1	107	64
Total U.S.	906	433	16	51	390	16	3,743,834	50,378	54,525	210	13	1	9	187	11,030	12,203
Total prev. week	899	426	24	51	384	14	3,802,291	.....	.....	197	18	0	4	175	.....	.....
Cum. 1957	50,378	25,892	584	3,609	19,276	1,017	208,639,979	.....	.....	11,030	1,103	99	370	9,458	.....	.....
Western Canada	45	26	0	3	16	0	225,758	2,810	3,054	17	3	0	0	14	804	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. ‡Incl. Florida & Georgia. †Incl. New York.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL PRODUCTION



ACTIVE ROTARY RIGS*

Area—	12-9-57	12-2-57	11-25-57	12-10-56
Alabama	9	6	7	9
Arkansas	29	28	28	21
Arizona	1	1	1	....
California	97	98	99	111
Colorado	47	44	47	66
Florida	2	2	2	2
Georgia	....	....	....	....
Idaho	....	....	....	....
Illinois	57	54	37	67
Indiana	5	8	8	15
Iowa	2	2	2	1
Kansas	162	152	146	187
Kentucky	10	9	6	11
Louisiana	381	370	389	484
North	46	41	52	61
South	256	250	257	326
Offshore	79	79	80	97
Maryland	1	1	....	....
Michigan	12	11	10	16
Missouri	....	....	....	1
Montana	33	34	36	34
Mississippi	50	37	44	28
Nebraska	32	25	25	28
Nevada	....	....	....	2
New Mexico	153	158	149	142
New York	1	1	1	....
North Dakota	48	46	42	29
Ohio	1	1	1	....
Oklahoma	257	265	245	280
Oregon	....	....	....	....
Pennsylvania	9	9	9	6
South Dakota	2	2	2	3
Texas	997	903	888	1,123
Gulf Coast	215	174	173	270
Offshore	5	5	5	10
West	371	352	347	380
North	349	327	317	388
East	57	45	46	75
Tennessee	....	....	....	....
Utah	56	56	55	29
Washington	1	1	1	1
West Virginia	4	4	4	3
Wyoming	67	65	67	67
Virginia	....	....	....	....
Total United States	2,526	2,393	2,351	2,766
Western Canada	180	175	166	241
Eastern Canada	2	2	2	....
Grand total	2,708	2,570	2,519	3,007

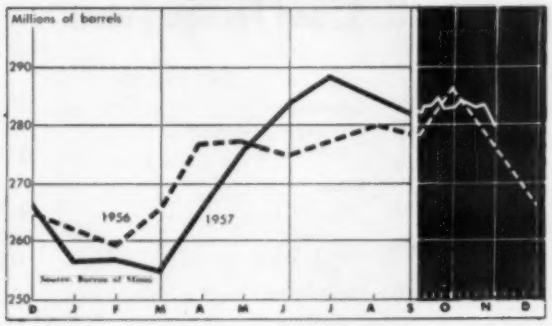
*Hughes Tool Co.

DAILY AVERAGE PRODUCTION FOR WEEK

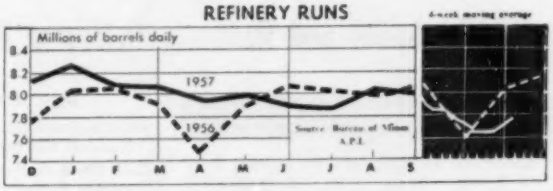
	December 7, 1957			Nov. 30
	Crude oil	Lease condensate	Total	total
Alabama	15,600	....	15,600	17,200
Arkansas	82,400	225	82,625	82,800
California	927,800	....	927,800	925,200
Colorado	141,100	....	141,100	143,650
Eastern	52,600	....	52,600	53,400
Florida	1,325	....	1,325	1,250
Illinois	235,400	....	235,400	232,000
Indiana	31,100	....	31,100	33,000
Kansas	†326,200	....	†326,200	†326,500
Kentucky	42,900	....	42,900	§42,900
Louisiana	752,300	80,500	832,800	817,100
North	110,300	2,500	112,800	113,100
South	642,000	78,000	720,000	704,000
Michigan	26,000	....	26,000	26,300
Mississippi	99,600	4,275	103,875	98,108
Montana	75,350	....	75,350	74,500
Nebraska	55,400	....	55,400	55,050
Nevada	100	....	100	100
New Mexico	256,600	5,500	262,100	254,350
North Dakota	39,500	....	39,500	33,000
Oklahoma	†571,400	....	†571,400	†584,700
Texas	2,657,000	58,400	2,715,400	2,721,400
Dist. 1	50,000	550	50,550	50,525
Dist. 2	121,000	9,300	130,300	129,050
Dist. 3	378,000	28,000	406,000	407,000
Dist. 4	197,000	6,400	203,400	204,350
Dist. 5	31,000	450	31,450	32,450
Dist. 6	109,000	6,400	115,400	116,400
East Texas field	160,000	....	160,000	162,000
Dist. 7-B	144,000	125	144,125	143,100
Dist. 7-C	151,000	4,075	155,075	153,850
Dist. 8	1,007,000	1,800	1,008,800	1,011,500
Dist. 9	206,000	700	206,700	207,600
Dist. 10	103,000	600	103,600	103,575
Utah	13,800	....	13,800	11,580
Wyoming	296,450	....	296,450	300,300
Others	‡150	....	‡150	‡200
Total U. S.	6,700,075	148,900	6,848,975	§6,834,580
Change from previous week, up	....	....	14,395	....
Canada	†409,960	....	†409,960	†422,500
Total U. S. Prod.-Jan. 1-Dec. 7				§2,446,451,610 bbl.
Same period last year (crude plus cond.)				*2,440,575,877 bbl.

*Includes 42,311,830 bbl. condensate. †Week ended previous Monday. ‡South Dakota. §Revised.

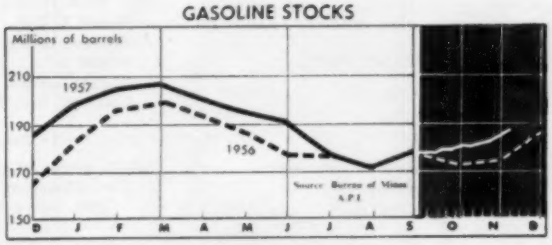
CRUDE-OIL STOCKS



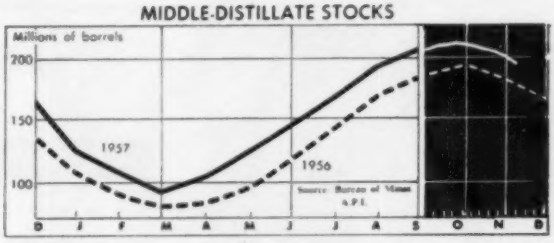
REFINERY RUNS



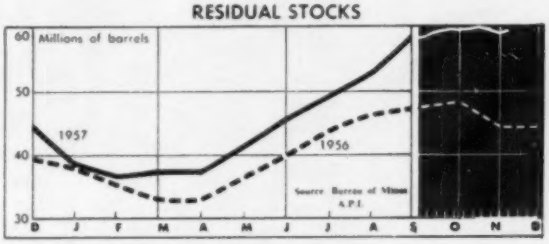
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-30-57	11-23-57	12-1-56
Pennsylvania Grade	3,154	3,196	2,358
Other Appalachian	1,780	1,795	2,254
Illinois, Indiana, and Michigan	10,488	10,470	11,405
Nebraska and North Dakota	3,103	2,726	2,128
Kansas	10,668	10,884	10,711
Oklahoma	20,519	20,596	23,974
Arkansas	2,739	2,685	2,801
Louisiana	20,075	20,791	17,442
North	3,309	3,342	2,561
South	16,766	17,449	14,881
Mississippi, Ala., and Fla.	2,804	2,956	3,272
New Mexico	9,501	9,571	7,933
Texas	124,576	125,765	124,881
East Texas	9,154	9,341	8,663
West Texas	54,785	55,547	59,363
Texas Gulf	25,868	26,218	24,370
Other Texas	34,769	34,659	32,485
Wyoming	13,672	14,037	16,944
Other Rocky Mountain	7,043	7,150	6,386
California	33,663	33,508	29,357
Foreign	†15,940	17,009	13,407
Total	279,725	283,139	275,253

*Bureau of Mines. †Includes 5,386,000 bbl. in California.

A.P.I. REFINERY REPORT—DECEMBER 6, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,094	477.2	34.0	328.6	177.4	44,522	13,619	64,669	13,275	1,200	500.1	50.3	329.4	234.3
Appalachian:														
District 1	108	50.4	3.6	22.7	10.0	5,085	627	3,414	664	103	40.2	5.6	25.5	9.1
District 2	112	55.6	7.3	22.4	16.9	2,676	474	1,450	347	108	55.9	6.6	23.4	16.2
Ind., Ill., Ky.	1,428	759.9	66.7	332.7	167.0	31,939	6,565	22,656	5,761	1,481	762.5	82.6	327.3	224.0
Minn., Wis., Dak.	106	51.0	2.4	30.0	12.6	6,867	1,362	7,571	350	97	48.7	4.8	26.3	10.9
Okla., Kans., Mo.	703	419.1	17.3	165.0	32.3	15,320	1,504	12,813	1,214	694	398.3	12.0	194.1	41.4
Inland Texas	245	189.1	5.1	41.7	22.6	6,937	428	2,272	2,173	279	201.8	10.6	53.0	28.0
Texas Gulf Coast	1,861	887.6	156.4	483.8	205.4	25,089	3,314	18,415	7,138	1,949	902.0	120.1	533.0	263.5
La. Gulf Coast	622	370.7	38.9	162.1	48.1	11,733	2,082	8,000	1,419	679	368.8	64.3	190.7	56.2
N. La. and Ark.	99	28.7	8.9	20.9	6.1	4,241	588	2,164	231	103	42.7	9.9	22.2	6.9
Rocky Mountain:														
New Mexico	28	15.6	.....	5.6	3.9	389	12	93	70	27	13.9	.4	5.0	3.3
Other Rocky Mt.	259	124.6	5.9	63.9	32.0	5,825	345	2,745	922	267	136.0	6.4	63.4	37.7
West Coast	1,142	523.4	3.1	162.9	350.3	27,464	363	16,883	25,275	1,154	514.8	4.9	187.8	356.3
Dec. 6, 1957	7,807	3,952.9	349.6	1,842.3	1,084.6	188,087	31,283	163,145	58,839	8,141	3,985.7	378.5	1,981.1	1,287.8
Nov. 29, 1957	7,807	3,886.4	327.4	1,793.4	1,046.0	185,203	32,661	167,594	58,807	.....	.....	.....	.....	.....
Dec. 7, 1956	7,865	3,891.0	412.1	1,885.4	1,194.3	175,427	33,111	145,550	43,755	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.75
Premium (98 octane)	14.25-14.50
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.50-11.00
★ Regular (92 octane)	10.75-11.25
★ Premium (97 octane)	12.25-12.75
★ Premium (98 octane)	12.50-13.00
California (rack) (Los Angeles):	
Regular (88 octane)	12.2
Premium (96 octane)	14.8
Premium (98 octane)	15.0
Caribbean area (cargoes):	
Regular (87 octane)	10.625
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
★ Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
Kerosine 41-43	10.75
Distillate No. 2	10.25
Diesel fuel, 48-52 d.i.	10.55
Caribbean area (cargoes):	
Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.60-1.80
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$2.95
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) ($)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Most buyers are posting Wyoming sour in two schedules, 15°-26.9° and 27°-40°.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
★ **Illinois Basin**	3.00-3.15
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

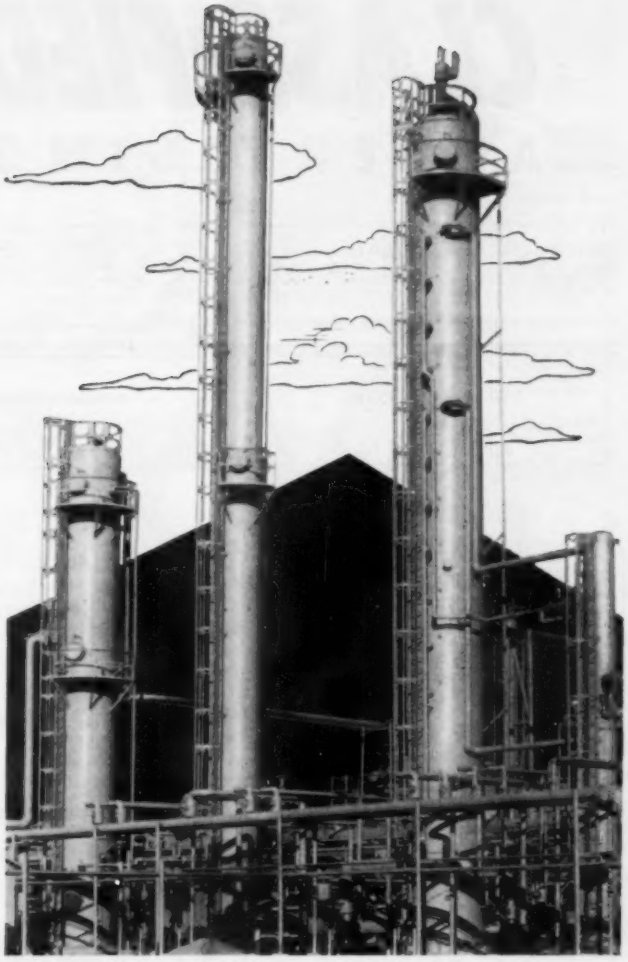
Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.59
Iraq, 36.0°-36.9°, Tripoli, Banias	2.59
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—25%)	$2.14
★ Carib.-U.S.N.H., dirty (USMC—52.5%)	1.28
★ Carib.-U.K., clean (Scale—36.25%) (20s. 9d.)	2.90
★ P.G.-U.K., dirty (Scale—55%) (24s. 4d.)	3.41

fingers in the sky point to Dallas Quality



In these towers are reflected the highest skills of pressure vessel craftsmanship . . . to serve you better and provide trouble-free operation. Whether you require custom fabrication of fractionating towers, scrubbers and other vessels or field erection of our equipment . . . you can count on Dallas dependability and quality. We specialize in the fabrication of fractionating trays and caps in accordance with your design and also offer trays and caps as designed by Dallas Tank Engineers. We fabricate tube and shell equipment of all types covering all ranges of temperatures and pressures. Make Dallas Tank your headquarters for prompt, efficient fabrication service, domestic and foreign . . . call, write or wire today for quotations on Dallas quality fabrications.

TWENTY-FIFTH ANNIVERSARY
1933 1958
DALLAS TANK COMPANY INC.

Write for New Dallas Custom Fabrication Folder

Plants at Dallas, Texas and Vicksburg, Mississippi

Dallas Tank Company, Inc. Dallas 22, Texas

CLASSIFIED —ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

UNDISPLAYED CLASSIFIED 25c a word one issue. 10% Discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$18.00 a column inch one issue
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment, at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.

NEW ELECTRIC WELD pipe rejects single and double random lengths 10,000 feet 9⅝ inch OD. .322 wall through .535 wall, 5,000 feet 16 inch OD. .250 wall through .312 wall, 6,000 feet 20 inch OD. .500 wall, 2,000 feet 26 inch OD. .250 wall, 1,000 feet 30 inch OD. .375 wall. Also other sizes. 3,000 feet 20 inch OD. .312 wall, used. G. N. Morrow, 217 Vernon Drive, Pittsburgh 28, Pa.

Limited Supply Still Available
WILLISTON BASIN SYMPOSIUM
28 technical papers with 333 illustrations discussing stratigraphy, structure, oil accumulation, reserves and economics. Includes Montana, Saskatchewan, Manitoba, North Dakota and South Dakota. Price $7.50.
Book Division, Conrad Publishing Co.
Bismarck, N. D.

FOR SALE

Wilson-Snyder Pump

6 x 24 Duplex PLGR Power Pump
Serial No. 10518
Capacity 490 GPM Max. (Hot Vol.)
Discharge Pressure 1000 lbs.
Pump RPM 46.4—Engine RPM 375

Driver

Cooper Bessemer

8 Cyl. 11½ x 13½
325 H.P. Type GNG 8 STB

Box K-467,
The Oil and Gas Journal,
Tulsa, Oklahoma.

FOR SALE

GOOD USED

SLUSH PUMP

1—"Giant" Mud Hog Duplex Power Slush Pump, size 10G; 6¾" x 14"; maximum working pressure—350 psi; BHP—94; 376 GPM at 45 RPM (normal)

$1250.00
(fob Tacoma)

GENERAL METALS
OF THE ALEUTIANS, INC.
1919 Canal St. Tacoma 2, Wash.
Tel. FU 3-3443

FOR SALE EQUIPMENT

CASING COUPLINGS:—81 pcs. 13⅜" OD x 8 Rd. thd. x 8" long, for sale. Never in use. JULIUS M. FOGELMAN, Reading, Penna.

FOR SALE EQUIPMENT

LIKE NEW—7" Heavy Duty Double Pole 65' Mast. Crane included. Price $360.00. Phone Tulsa, TEmple 5-2889.

DRILLING BARGE

140' x 50' x 16' slotted barge with complete National 100 rig. Galley, tool pushers office, conveyor—equipped mud house. 1,000,000# Moore 136' mast and substructure, 10,000'—4½" drill pipe, new BOP's. Pumps independently driven in water tight pump room on main deck: C-350 with GM Quad and C-250 with GM twin.

W. D. Kent, Salt Dome Production Company,
737 TEXAS NATIONAL BANK BUILDING,
CA 2-0176, HOUSTON.

We Own The Equipment We Advertise.

BRILL BUYS—THE BEST!

STAINLESS STEEL
HEAT EXCHANGERS
1—Vulcan 1228 sq. ft.
1—947 sq. ft.
2—Struthers-Wells 570, 536 sq. ft.
2—Struthers-Wells 380, 315 sq. ft.
2—157 sq. ft. U Tube 1000#
1—250 sq. ft. 900#
VESSELS
3—Wyatt Bubble Cap Towers; 30" x 20' 8 trays 50#, 2' x 42' 22 trays 230#, 18" x 23' 11 trays 200#

STEEL VESSELS
2—12' x 45' Storage Tanks, 25#.
1—14' x 21' Clay Tower, 125#.
1—8' x 75' Tower, 20 Trays, 25#.
1—18" x 32' Tower, 15 Trays, 160#.
1—8½' x 25' Tank.
5—Packer Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 550#, 24" x 28'.
1—12" x 27' Absorber, 20 Trays, 450#.
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 45' tower 24 trays.

HOT-OIL PUMPS
3 Pacific ITB, 400 gpm.—2,000' hd. 735 gpm—3,100' hd.
5 Pacific 5VTB, 621 gpm—600' hd. 324 gpm—480' hd. 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 gpm—400' Hd.
BJ hot oil pump, 3 x 9, 14 st, 324 gpm, 4600' hd.

HEAT EXCHANGERS
4—Kellogg Adm. Flg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Steel Flg. Had. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome
5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
6—Adm. 785, 742, 425 Sq. Ft.
2—4-6% Chrome 1,000, 500 Sq. Ft.

COMPRESSORS
1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 LBS. 385 CFM 160 lbs.

MISCELLANEOUS
6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
2—Lab Petro-Chem furnice, ½, ¾ mil. BTU/hr.
Tremendous selection stainless steel and steel valves 1½"-6".
Goulds 16" pump, 10,500 gpm, 135' hd.

PARTIAL LIST ONLY

WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE EQUIPMENT

FOR SALE—Clark model HMA-4 gas engine driven skid mounted (packaged) compressor with 179 HP, two stage, 3¼" and 2⅝" by 8¼" compressor cylinders, 400 PSI suction, 2900 PSI discharge, 59,000 CFH, unused, contact Demse, Lowell Gas Co., Lowell, Mass.

STEEL PIPE & TUBING

VALVES AND FITTINGS

• MONEL • CARBON STEEL • STAINLESS
• CHROME MOLY • CARBON MOLY

Widest Range of Sizes & Specs in the U. S.

WRITE FOR STOCK LIST

MIDCONTINENT TUBE SERVICE, INC.
2308 Oakton St., Evanston, Ill. DA 8-4030

OPPORTUNITY

Here is an excellent opportunity for profit minded executives to purchase, at a fraction of new cost, excellent Oil Refinery Equipment Thru

2 MORE OIL REFINERY LIQUIDATIONS BY HEAT & POWER

As with all our liquidations, we maintain at all times representatives ON LOCATION to answer any questions you may have.

TIDEWATER OIL CO.
DRUMRIGHT, OKLA.

HOUDRIFLOW CATALYTIC CRACKING UNIT, 8000 BBL./DAY (NEW 1952)

Other Highlights

Condensers—Heat Exchangers, New Furnace & Condenser Tubes, Pressure Vessels, Pumps, Reboilers, Tanks, Towers, Chemicals, Paints, Dyes, Warehouse Supplies.

Site Office—Drumright, Okla.
(P. O. Box 587 Phone 569)

D-X SUNRAY OIL CO.
ALLEN, OKLA.

18 COLUMNS 1'6" to 9'6" DIAMETER
Various Constructions, Diameters and Heights

(5) OIL HEATERS—LIGHT & MEDIUM

Other Highlights

Boilers, Pumps, Power Equipment, Condensers—Heat Exchangers, Reboilers, Pressure Tanks, New Furnace & Boiler Tubes, Reactors, Stocks, Instruments, Electric Motors, Steel Buildings, Transformers, Electric Motors, Oil Purifiers.

Site Office—Allen, Okla.
(P. O. Box 344 Phone 90)

For full information and brochures on the above liquidations write today. No obligation.

HEAT & POWER Co., Inc.

REFINERY EQUIPMENT DIVISION

60 EAST 42nd ST.
NEW YORK 17, N.Y.
MUrray Hill 7-5280

310 THOMPSON BLDG.
TULSA 3, OKLAHOMA
Diamond 3-4890

FOR SALE EQUIPMENT

FOR SALE: Model RL Cardwell spudder. Equipped to service 8000 foot wells. In excellent repair. Presently operating Ft. Morgan, Colorado area. Considerable company work will be given purchaser. Contact Lowell J. Williamson, 2150 South Bellaire, Denver, Colorado, SKyline 6-8333.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

1 36L BUCYRUS Spudder complete with 5 and 7 inch tailing in tools. Dog house, butane tank, junk rack and light plant. Rod and tubing tools and hand tools. Phone Office 144, Res. 614, Cleveland, Oklahoma.

REBUILT WAUKESHA WAK engines, ICK starting motors. Ensign butane-natural gas equipment. Twin Disc clutches. Mounted on 2-engine compound. Rocket Drilling Co., 6516 Grand Blvd., Oklahoma City. Phone VI 2-3727.

UNIT RIG with 95-ft. Lee C. Moore mast. Emsco D-300 7½ x 14 slush pump. 5,600 ft. 4½ Grade E full hole drill pipe. Complete and ready to drill. Rocket Drilling Co., 6516 Grand Blvd., Oklahoma City. Phone VI 2-3727.

FOUR (4) Waukesha Gas/Butane Engines. Model WAKBU. Gasoline engine starter. Clutch and power take-off. Radiators. Ready to go, $4,500.00 each. Call or write: F. W. Smith, P. O. Box 3037, Midland, Texas. Phone: MU 2-8753.

FOR SALE at Tallant, Oklahoma, 3—36" diameter x 34'5" steel fractionating vertical towers, ¼" steel shell, ½" steel heads, all welded construction, 40 trays, 7" spacing, 50# test, each $1500.00. 1—30" x 30' ¼" shell, ⅜" top head, ⅜" bottom, Tulsa type riveted absorber, 12 trays, 20" spacing 75# WP, price $500.00. All vessels used in alcohol manufacture. Have been laid down for truck movement. Cities Service Oil—Patridge—Bartlesville.

FOR SALE at Tallant, Oklahoma, 1—used Sprague-Sells 12-valve one quart liquid filler unit maximum 120 CPM with 1—45° flight booster unit with motor and 1—Model E Boxer with motor—Lot $1,000.00. Cities Service Oil—Patridge—Bartlesville.

WRITE, PHONE, TELEGRAPH Cardwell Investment Co., Inc., 604 Petroleum Building, Wichita, Kansas: phone AM 5-2611, for Cardwell Slim Hole or Complete Rotary Rigs, Cardwell Model L, Model D, Cardwell Spudders, Wilson Giant, Joy Slim Hole and National T-12. Terms to responsible people.

PIPE FOR SALE:

2450' of 8⅝" 32# Seamless
850' of 10¾" 51# Seamless
450' of 13⅜" 61# Seamless
260' of 15½" 75# Seamless and lapweld.
Pipe in A-1 Condition, located at Russell yard.

Also 36L Bucyrus Rig with drilling leg; now working, lots of big hole tools.

JAYHAWK WELL SERVICING CO.
P. O. Box 507 Phone HUdson 3-3732
Russell, Kansas

Gas Compressors Sale

1—150 HP Class, 1000 lb. Working Pressure Ingersoll-Rand angle frame, single stage model 4XVG-1. This is a new skidded unit complete with air starter, compressor, radiator, oil cooler, inter-connecting water and gas plumbing, inlet scrubbing tank. This compressor equipped for unattended operation.

1—150 HP class same as above except 700 lb. working pressure.

The above machines may be changed for 2 stage operation.

The above compressors were installed by a major gas utility company, but were never put into operation.

(Priced below the market)

BOX K-461,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

HELP WANTED

MALE TECHNICAL graduate wanted for gasoline testing laboratory in Tulsa, Oklahoma. Forty-hour week with excellent working conditions and liberal benefit plans. State experience and salary expectation. Box K-457, The Oil and Gas Journal, Tulsa, Oklahoma.

GENERAL MANAGER, Plant Superintendent, Division Supervisors and Senior Process Engineers needed by new ammonia fertilizer plant in overseas U. S. possession. Permanent positions with company having good growth potential. Chemical Engineering degree plus experience at corresponding level in ammonia, oil refining or related industries required. Attractive salaries and benefits, pleasant climate. No placement fee. Reply GEORGE ARMISTEAD and COMPANY, 1000 CONNECTICUT AVENUE WASHINGTON, D. C.

PETROLEUM ACCOUNTANT

Practical accountant to function as office manager and accountant. Knowledge of field operations, materials and where used will be helpful. Tax experience not required. Reasonable salary.

CRAWFORD PRODUCTION COMPANY
316 Enterprise Building, Tulsa 3, Okla.

ENGINEERS AND DRAFTSMEN

with minimum five years direct experience in electrical or mechanical design of oil, products or gas pipeline systems, including pump stations, compressor stations, terminals and tank farms. Ages 25 to 35 years. Excellent opportunity for permanent position in Tulsa office of progressive, worldwide engineering and construction firm. Send resume of experience to attention Charles J. Flint. All inquiries confidential.

Williams Brothers Company
326 NATIONAL BANK OF TULSA BLDG.
TULSA, OKLAHOMA

POSITIONS WORLD WIDE FOR U. S. CITIZENS

Employment immediately available in South America and 23 other countries!

- EMPLOYMENT BY MAJOR OIL COMPANIES
- FAMILY TRANSPORTATION PAID
- SALARIES OPEN
- NO U. S. INCOME TAX
- ATTRACTIVE BONUSES AVAILABLE
- RENEWABLE EMPLOYMENT CONTRACTS
- PLACEMENT FEE OFTEN PRE-PAID

Immediate need for:

GRADUATE ENGINEERS—Age to 50; All types used in or related to any phase of the Petroleum Industry. Experienced or Inexperienced.

GRADUATE GEOLOGISTS—Age to 35; Exploration experience required.

TOOLPUSHERS—Age to 40; 3-5 years experience.

SUPERVISORS—INDUSTRY-WIDE—Age to 50; Operations—Processes—Crafts; 5 years SUPERVISORY EXPERIENCE.

YOUR INQUIRY COMPLETELY CONFIDENTIAL

Send Education and Employment Resume to

LOVELESS PERSONNEL SERVICE
616 S. Main • Tulsa, Oklahoma • LU 4-3601

HELP WANTED

RESERVOIR ENGINEERS

(Ages 27 - 38)

A major integrated U. S. oil company operating in Venezuela has outstanding career opportunities for qualified RESERVOIR ENGINEERS. Excellent growth possibilities are present in an expanding technical organization. Graduate engineers and physicists who have had FIVE to TEN years of specialized and general petroleum reservoir engineering experience are invited to submit a complete resume of work experience and personal data. Naturally, all replies will be held in confidence and interviews arranged for qualified candidates. Salary, including bonus, $14,900-$18,000, depending on qualifications and experience. Company is a leader in the petroleum industry with excellent employee benefits, including home vacations with travel expenses.

Box 480

Department Y-21

New York 19, N. Y.

HELP WANTED

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla., Tom Robinson, owner, GI 7-5974. Technical, trained personnel write us.

SAFETY ENGINEER for expanding offshore and land drilling contractor and producing company operating in the Louisiana Gulf Coast area. Experience in drilling activities and college degree desirable. Salary commensurate with ability and experience. Send photograph and complete personal history, including education, experience and salary requirements to Box K-360, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURER'S AGENTS for well established Sub-Surface Manufacturer. Several territories open, due to expansion program. Box K-469, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER: Graduate chemical or petroleum engineer with 5-10 years refinery process engineering experience wanted by an integrated independent oil company located in the Mid-Continent area. Excellent opportunity for advancement in this growing company which operates two refineries. In reply give summary of education and experience, photograph, date available and salary expected. Box K-473, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED:

Experienced accountant for aggressive, Denver based, independent oil firm. Must be able to assume office manager position. Excellent salary for top caliber man.

BOX K-465,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

CHIEF DRAFTSMAN

Aggressive, independent oil company located in Denver. Should be familiar with modern reproduction techniques. Include sample of work, photograph helpful. Salary Open.

Write:
BOX K-456,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs, $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

WANTED:

Geologist with top qualifications for top paying job with aggressive Denver independent, active in Colorado and Canada. Canadian experience desirable but not necessary. Send references and qualifications.

Box K-466, The Oil and Gas Journal, Tulsa, Oklahoma.

Chief Process & Design Engineer
for
Gas Processing and Gasoline Refining Plant

Canadians Note—Unusual opportunity for supervisory engineer with young, growing, integrated Canadian oil company. Should have 10 years experience in plant process and design engineering.

Box K-463,
The Oil and Gas Journal,
Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM CHEMIST, B.S. Over 20 years experience laboratory supervision and refinery operation. Petrochemicals. Available at once. Box K-468, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, age 33, MS, 7 years experience with major in Oklahoma in completions, production, reservoir, geological and economic analyses of new and old production. Box K-471, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND POSITION WANTED

Geologist with independent oil company, with over three years diversified experience, desires to learn land and lease work. Accustomed to working with land department; willing to pursue education further through evening and correspondence courses.

Box K-462, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, Masters degree 1954, three years research, sedimentation, marine geology; desire West Coast position in research, oil, or mining geology. Box K-452, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 30, Master's, 5½ years major, 1 stratigraphic, 4½ subsurface in Texas, some surface Rocky Mountain area, will relocate. Box K-459, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 34, PhD., 4 years experience with USGS stratigraphy in Rocky Mountain area. Desires position in research or exploration. Box K-472, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—13 years experience drilling, production, evaluations, appraisals. Last six years in executive capacity. Desires position with active independent. Box K-464, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

WANTED: Oil properties, 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

BUSINESS SERVICE

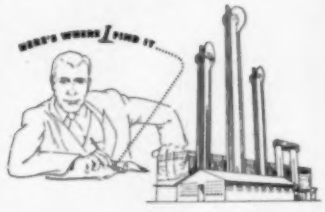
Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

WANTED

PRIVATE PARTY desires good primary drilling acreage, with or without production at present, and with pay zone less than two thousand feet. Must be in Southern Oklahoma, North Texas, or New Mexico. Submit full details of terms, geology, lease status, etc., in first letter. Box K-442, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING CAPITAL WANTED: We will send geologist's report on structure southwest Arkansas. We have drilled to lower Cretaceous and geologist recommends deepening to Pennsylvania sands with possible prolific gas. Burns Oil Co., Box 1098, Shawnee, Okla.

Can You Help This Man?



It's a good bet that you can!

Actually he's a lot of men. Men that have jobs to fill or want a new position; equipment to buy or sell; production, acreage, leases, or real estate to sell or buy; or a business opportunity. He may be looking for your services, maps, or field records.

Why Not Tell Him You Have
What He Wants With
A JOURNAL CLASSIFIED

The cost is reasonable:—26¢ per word or $18. per Col. in. Minimum $5. for word ads, 1 in. for Display. 10% reduction for three consecutive insertions of the same copy. (This ad is 1 col. wide and 5 in. deep.)

For assistance on classified ads, write

THE OIL AND GAS JOURNAL
P. O. Box 1260 — Tulsa, Okla.

ROYALTIES

WE WANT producing royalties, producing oil & gas properties, also farmouts gas acreage. Ben H. Williams — Clarendon, Texas.

LEASE AND DRILLING BLOCKS

400 ACRE FARM OUT: Guarantee title, good geology. 2,300 ft. Very attractive. $1.00 per acre and ⅛. Trade 220 acre farm for production or sell for $55. acre. Phone 79, Perry, Okla. P. O. Box 253.

LEASES ON Minerals for sale in St. Martin, Iberia, and St. Marys Parish, La. Bernard Milmo III, 1231 Bradley Ave. La Marque, Texas.

GET VERY SHALLOW high-grade oil; larger net profits. I have the structures for such; you can get them. N. M. Sauls, Geologist, Cookeville, Tenn.

OIL AND GAS LEASE—Largest undeveloped area in proven territory. Northern W. Virginia. Excellent possibilities in five sands. Need partner or sell outright. Anna A. Brost, Ft. Washington, Pennsylvania.

OIL LEASES, Royalties, shallow drilling deals. Call or write, R. E. Clement, Box 65, Norman, Oklahoma.

15,000 ACRES LEASED IN BOX ELDER County, Utah together with favorable geologic report of structure. Available for exploration drilling. Contact Fred Foss, 235 Second Avenue South, Twin Falls, Idaho.

OIL LEASE WORKING INTERESTS.
I will sell to finance drilling shallow or deep wildcats on Eastern Oklahoma acreage. Write Paul M. Jameson, Geologist, 1516 North Boston, Tulsa, Oklahoma.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

SHALLOW OIL PRODUCTION WANTED

Also Will Buy Abandoned Wells.

Write Full Particulars To

C. E. Stout, Atlas Oil Survey,
Dept. PW, 614 Colorado Building,
DENVER 2, COLORADO

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-34 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for catalog 57-B. Ross-Martin Co., P. O. Box 800-A. Tulsa, Okla.

ENGINEERING SERVICES

LIMITED TIME available to provide special engineering reports on your oil and/or gas leases, proposed or drilling wells. Write, John R. Shoffner, Reg. Prof. Engrs. Kittanning, Pa.

BUSINESS OPPORTUNITIES

INVESTORS - WILDCATTERS. Are you interested in developing large virgin oil and/or gas fields in Ohio, Pennsylvania, New York, or eastern Canada? We have much detailed research information on many fields. Write, John R. Shoffner, Reg. Prof. Engr., Kittanning, Pa.

FINANCIAL CONTACTS. Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817 51st St., Brooklyn, N. Y.

ATTENTION—

OIL PRODUCERS
DRILLING CONTRACTORS

Want to buy interest or royalty in oil wells. Have large stocks of New Casing and Tubing to exchange and help finance your drilling costs . . . will also accept oil payments. Please furnish complete details.

BOX K-470,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

ADVERTISERS
in this issue

A
Ajax Iron Works ... 11
Allis-Chalmers Mfg. Co. ... 41
Aluminum Co. of America ... 22
American Brass Co., The ... 97
American Chemical Paint Company ... 18
American Petroleum Institute ... 173

B
Babcock & Wilcox Company—Boiler Division ... 8
Bakelite Company, A Division of Union Carbide Corporation ... 156
Baker Oil Tools, Inc. ... 56
Bendix Aviation Corporation ... 43
Bethlehem Steel Co. ... 117
Bovaird Supply Company ... 1
Braden Winch Company ... 169
BrakeSol, Inc. ... 146
British Petroleum Company Limited, The ... 128
Byron Jackson Co. ... 183

C
Caterpillar Tractor Co. ... 124
Chicago Bridge & Iron Company ... 95
Classified Advertising ... 200, 201, 202
Colorado Fuel and Iron Corporation—Wickwire Spencer Steel Division ... 10
Continental Oil Company ... 28, 29
Crose Manufacturing Co., Inc., M. J. ... 138

D
Dallas Tank Company, Inc. ... 199
Dearborn Chemical Company ... 35
De Laval Steam Turbine Co. ... 23
Dowell Incorporated ... 106
Drilling & Service, Inc. ... 188
Duriron Company, Inc., The ... 160

E
Edward Valves, Inc. ... 137
Electro-Motive Division General Motors ... 142, 143
Elgen Corporation, The ... 175
Enjay Company, Inc. ... 50
Ethyl Corporation ... 100, 101

F
Fairbanks, Morse & Co. ... 4
First National Bank of Shreveport, The ... 154
First National Bank & Trust Co. of Tulsa, The ... 146
Fish Companies, The ... 27
Fleet-Line Co. ... 136
Fluid Packed Pump Company ... 44, 45
Foxoro Company, The ... 16, 17

G
General American Transportation Corporation ... 54
Goodrich Industrial Products Company, B. F. ... 5
Gott Mfg. Co., H. P. ... 189
Grancell, I. H. ... 141
Grant Oil Tool Co. ... 140
Guiberson Corporation ... 187
Gulf Oil Corporation ... 119

H
H & M Pipe Beveling Machine Co. ... 161
Halliburton Oil Well Cementing Co. ... Inside Front Cover, 12, 13, 179
Harbison-Fischer Mfg. Co. ... 107
Hercules Tool Company ... 149
Houdry Process Corporation ... 118
Hughes Tool Co. ... Back Cover
Hunt Tool Company ... 127

I
Inferno Co., The ... 141
Ingersoll-Rand ... 25
International Harvester Co. ... 158, 159
International Nickel Company, Inc., The ... 58

J
Jefferson Chemical Company, Inc. ... 135
Johns-Manville Corporation ... 26
Johnston & Jennings Company, The, Division of Pettibone Mulliken Corporation ... 151
Jones & Laughlin Supply Division ... 49

K
Kaiser Aluminum & Chemical Sales, Inc. ... 112, 113
Kittell Muffler & Engineering, Inc. ... 154
KLM Royal Dutch Airlines ... 182
Koppers Company, Inc. ... 139

L
Larkin Packer Company, Inc. ... 174
Layne & Bowler, Inc. ... 15
Leland Equipment Co. ... 186
Levingston Shipbuilding Co. ... 149
Link-Belt Company ... 7
Lone Star Steel Company ... 103
Lufkin Foundry & Machine Co. ... 170

M
Macco Oil Tool Co. ... 151
Magnet Cove Barium Corp. ... 155
Massey-Harris-Ferguson, Inc. ... 33
Master Electric Company, The ... 42
Maxim Silencer Company, The ... 148
Mayo Hotel, The ... 136
Mid-Continent Supply Company ... 162
Miller Sand Pump Co. ... 144
Minneapolis-Honeywell Regulator Co., Industrial Division ... 108, 109
Mission Mfg. Company ... 121
Monsanto Chemical Company ... 47
Morland Associates ... 144
Mueller Co. ... 14

N
National Bank of Commerce, The ... 19
National Bank of Tulsa ... 193
National Supply Co., The ... 37, 38, 39, 40
Industrial Products Division ... 165
National Tank Company ... 204
Nelson Electric Mfg. Co. ... 152
Nordstrom Valve Division, Rockwell Manufacturing Company ... 20, 21

O
Oil Center Tool Co. ... 53
Oil Well Supply Division ... 6
Oliver Corporation, The ... 9
Otis Engineering Corporation ... 48

P
Paris Distributor, Inc., Henry H. ... 120
Peerless Pump Division of Food Machinery & Chemical Corporation ... 147
Petro-Chem Development Co., Inc. ... 132
Petroleum Distributing Co. ... 144
Philco Corporation ... 30
Plastic Applicators Inc. ... 177

R
Raybestos-Manhattan, Inc., Packing Div. ... 181
Refinery Supply Co., The ... 153
Republic National Bank of Dallas ... 189
Rolatape Inc. ... 180
Ross-Martin Co. ... 150
Ryerson & Son, Inc., Joseph T. ... 184

S
Sinclair Oil Corporation ... 122
Smith Corporation, A. O. Meter, Service Station Pump Division ... 36
Southland Battery Co. ... 154
Southwest Industries, Inc. ... 115
Spang & Co. ... 171
Strahman Valves, Inc. ... 150

T
Tellurometer, Inc. ... 172
Thomas Flexible Coupling Co. ... 178
Thompson Tank & Manufacturing Co., Inc. ... 153
Thornhill-Craver Co. ... 111
Twin Disc Clutch Co. ... 24

U
Union Carbide Chemicals Company, Division of Union Carbide Corporation ... 31
United States Steel Corporation—Oil Well Supply Division ... 6
Witte Engine Works Oil Well Supply Division ... 176
Universal Oil Products Co. ... 32

V
Visco Products Co., Inc. ... 99
Vogt Machine Co., Henry ... 34

W
Waldron Corp., John ... 46
Wallace & Tiernan Incorporated ... 52
Warren Petroleum Corporation ... Inside Back Cover
Weatherford Oil Tools Co., Inc. ... 51
Well Equipment Mfg. Corp. ... 166
Western Supply Company ... 130
Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp. ... 10
Witte Engine Works Oil Well Supply Division, United States Steel Corporation ... 176

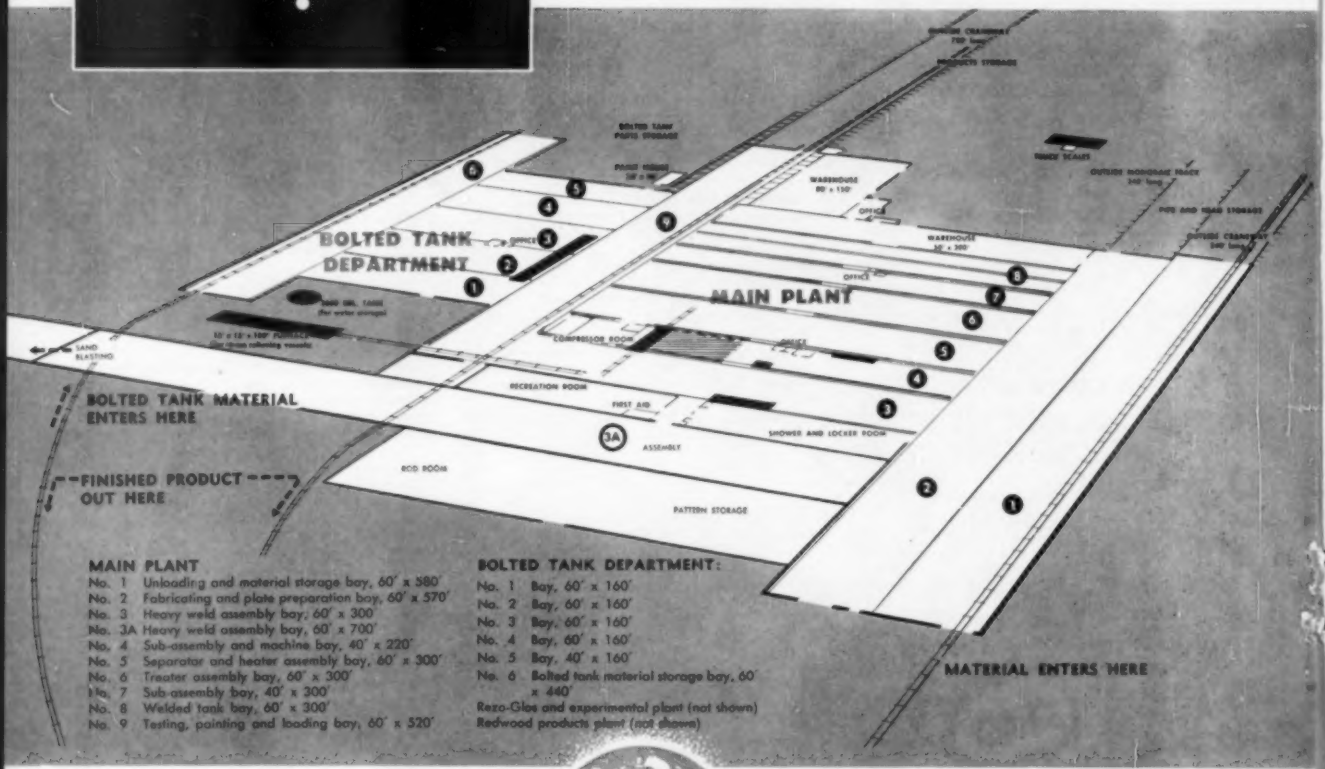
8 ACRES OF HIGH-BAY FABRICATION FACILITIES UNDER ONE ROOF

Custom Fabrication is a specialty of National Tank Company. Whether it's a small storage tank or a complete refinery, National Tank has the knowledge, the know-how and the facilities to produce it.

In addition to the design and engineering personnel who know customer requirements and material qualities, National production facilities include:

- Hydraulic presses up to 1500 tons for forming, piercing, blanking, etc.
- Bending rolls with capacity up to 3½" plate
- Cranes up to 100-ton capacity
- 2000°F. forming furnaces
- Stress relieving furnaces up to 15' x 15' x 100'
- X-Ray and Gamma Ray equipment to penetrate over 6" of steel
- Automatic welding machines
- Punch presses, circle shears, lathes, boring mills, flanging machines, plate shears
- Tensile testing machines
- Complete machine shop facilities
- Degreasing and painting equipment
- Plus acres of storage space

For additional information, contact any of the over 50 sales and service offices of National Tank Company in the United States and Canada, or write, wire, 'phone National Tank Company, CHerry 2-9141, Box 1710, Tulsa, Oklahoma.



MAIN PLANT

No. 1 Unloading and material storage bay, 60' x 380'
No. 2 Fabricating and plate preparation bay, 60' x 570'
No. 3 Heavy weld assembly bay, 60' x 300'
No. 3A Heavy weld assembly bay, 60' x 700'
No. 4 Sub-assembly and machine bay, 40' x 220'
No. 5 Separator and heater assembly bay, 60' x 300'
No. 6 Treater assembly bay, 60' x 300'
No. 7 Sub-assembly bay, 40' x 300'
No. 8 Welded tank bay, 60' x 300'
No. 9 Testing, painting and loading bay, 60' x 520'

BOLTED TANK DEPARTMENT:

No. 1 Bay, 60' x 160'
No. 2 Bay, 60' x 160'
No. 3 Bay, 60' x 160'
No. 4 Bay, 60' x 160'
No. 5 Bay, 40' x 160'
No. 6 Bolted tank material storage bay, 60' x 440'

Rezo-Glas and experimental plant (not shown)
Redwood products plant (not shown)

It's a National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

WARREN Resources of Production, Transportation and Storage, and WARREN'S Experience as a Specialist in its field assure you of Complete and Dependable DELIVERIES of . . .

NATURAL GASOLINE

whatever the grade and the volume

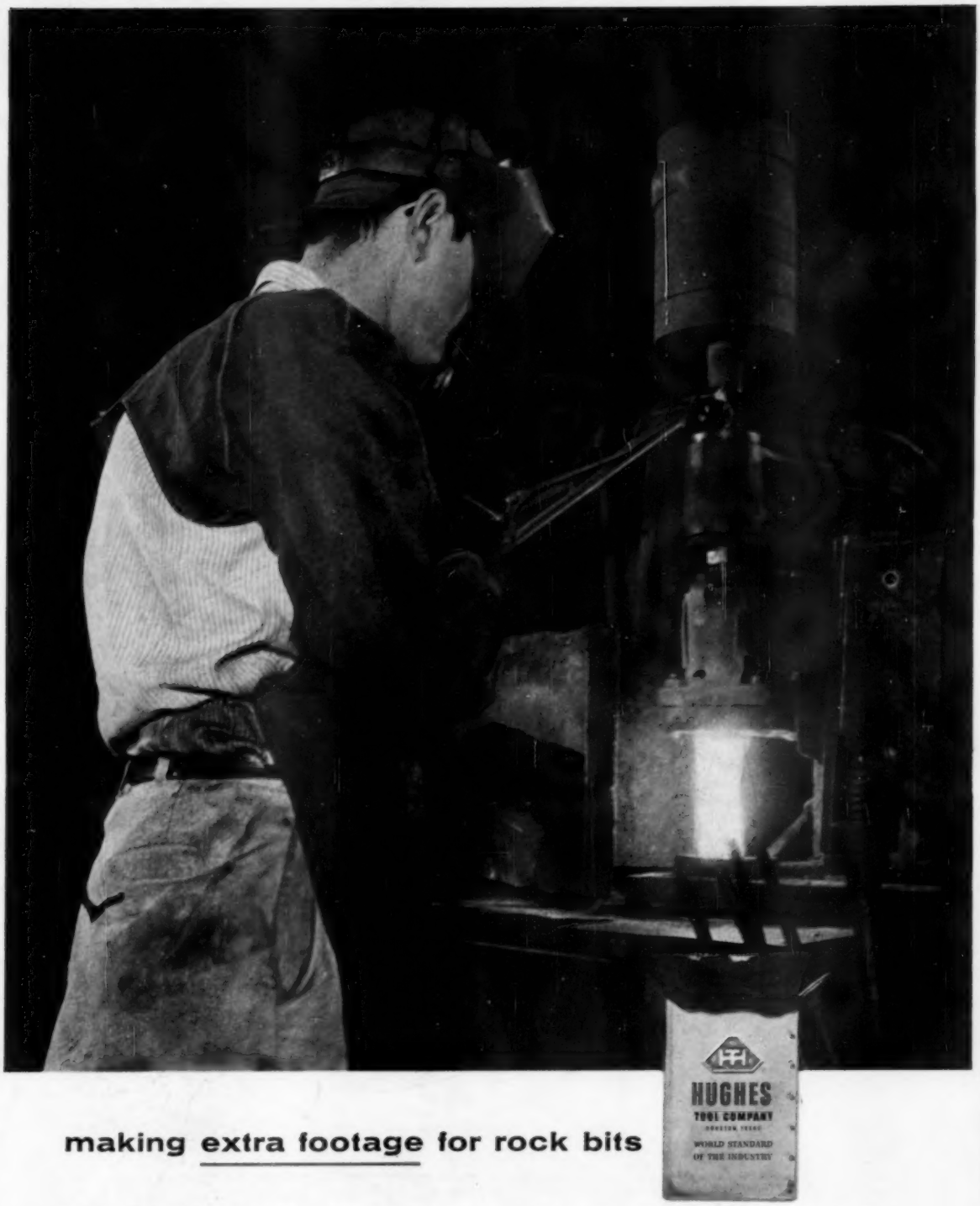
for
QUALITY
QUANTITY
SERVICE
Rely on

WARREN

PETROLEUM CORPORATION

TULSA, OKLAHOMA • Cable Addresses: STAVOLENE, WARREN

EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN, TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS, SAN PEDRO, CALIF.



making extra footage for rock bits

The "white hot" metal being alloyed here at over 5000° F., is molten *Hughesite* — one of the hardest known man-made materials. It is 25 times more wear-resistant than hardened steel. *Hughesite* is an exclusive Hughes development. Hughes' methods of applying *Hughesite* to bit teeth and gauge surfaces are increasing the rate of penetration and footage drilled per bit. Here is another example of HUGHES' continuing effort to provide the drilling industry with the best possible tools.